WIRE AND WIRE PRODUCTS

MAY 1940

HOW WILL YOU PLAY *these* CARDS ?

EQUIPMENT
Complete Wire Drawing Equipment ...Continuous or Single Hole... For the Largest Bars... For the Smallest Wire... Ferrous, Non-Ferrous Materials or Their Alloys

The wire manufacturer who today is equipped with Vaughn Machinery has more than just luck in his hand no matter how the game goes in the future. He can profitably play his production cards close to his vest or raise and call as the times dictate—because quick-moving Vaughn Flexibility gives him strategic advantages lacking in cumbersome old-style equipment.

The facts are interesting to every wire-maker with an eye to the future. Let a Vaughn Representative go over them with you!

THE VAUGHN MACHINERY COMPANY CUYAHOGA FALLS, OHIO, U. S. A.

Vaughn

WIRE DRAWING MACHINERY

OFFICIAL PUBLICATION OF THE WIRE ASSOCIATION

WILSON *Furnaces* FOR WIRE ANNEALING

INTERNATIONAL TRADE MARKS

CABLE ADDRESS—"SENWIRE" FOSTORIA, (OHIO)
CODES—WESTERN UNION, LIEBERS, A.B.C. FIFTH EDITION, A.B.C. IMPROVED, BENTLEY

TELEPHONE 160

THE SENECA WIRE & MFG CO.

MANUFACTURERS OF
"SENECA" BRANDS
WIRE

FOSTORIA, OHIO, U.S.A.

LUCIAN E. KINN
PRES., GEN. MGR.
HERMAN J. BLASER
VICE PRES.
HOWARD L. MARTIN
SECRETARY
LEONARD J. SCHREINER
TREASURER

March 26, 1940

DIRECT REPLY FOR ATTENTION OF:

AGREEMENTS ARE CONTINGENT ON STRIKES, ACCIDENTS AND OTHER CAUSES BEYOND OUR CONTROL. ALL QUOTATIONS ARE SUBJECT TO CHANGE WITHOUT NOTICE. ANY TAX IMPOSED BY LAW AFFECTING THE ITEMS COVERED HEREIN SHALL BE ADDED TO THE SALES PRICE THEREOF.

Lee Wilson Engineering Co.,
1370 Blount St.,
Cleveland, Ohio.

WIRE
IRON - STEEL - ALLOY
LOW CARBON - HIGH CARBON
S. A. E. SPECIFICATION
ROUND - FLAT - HALF ROUND
SHAPES
STRAIGHTENED AND CUT

FOR
BELT HOOKS
BINDING - BONNETS
BOOKBINDERS
BROOMS - BRUSHES
CLIPS - COTTER PINS
CRIMPING
CUSHION SPRINGS
FLORIST - GLASS WIRE
GRAPE TYING
HAIR PINS - HEDDLES
HOOK AND EYES
LINK FABRICS
LOCK WASHERS
MATTRESSES
PICTURE CORD - PINS
ROCK FASTENERS
SPECIAL SPRINGS
ROPES - STAPLING
STONE WIRE
TAGS - WEAVING

WELDING WIRE

SIZES
NO. ¼ TO NO. 40 W & M GAUGE

OIL TEMPERED SPRING WIRE

FINISHES
LIQUOR FINISH—BRIGHT
GALVANIZED—COPPERED
ANNEALED—TINNED
OIL TEMPERED

FLY SCREEN WIRE CLOTH

This is a picture of the three Wilson Annealing Furnaces which are in use at our plant.

Yours truly,
THE SENECA WIRE & MFG. CO.
L. E. Kinn, Pres. and Gen.Mgr.

LEK:CK

The Wilson Annealing Unit is covered by Patents Nos. 1952402, 2068477, 2078356, 2081612, and other patents pending.

An Exclusive Development of
LEE WILSON ENGINEERING CO.
1370 Blount Street • Cleveland, Ohio

Back Relief Is Particularly Important In Cemented Carbide Dies

The back relief on cemented carbide dies is of special importance and should always be given sufficient consideration. Its purpose is three-fold:

1. To help prevent removal of the lubricant or coating from the die.
2. To prevent the die from chipping out at the back of the nib.
3. To place the burden of the work in the center or front of the die, allowing as much metal as possible to back up the working area. This is particularly desirable with a material as hard as cemented carbide!

In many cases, especially on sizes ¼″ and larger, if there isn't sufficient back relief in the die a peripherial crack will come in the die at the bearing. It has definitely been proven that by increasing the back relief this trouble has been overcome. The following set-up will give good results in the average mill:

Sizes	0 to .062″	.....	1/32″ back relief
Sizes	.063 to .250″	.....	1/16″ back relief
Sizes	.251 to .500″	.....	3/32″ back relief
Sizes	.501 to 1.000″	.....	1/8″ back relief
Sizes	1.001 to 2.000″	.....	3/16″ back relief
Sizes	Over 2.000″	.....	1/4″ back relief

Carboloy Sheet Metal Draw Dies Still Operating After 7,200,000 Pieces

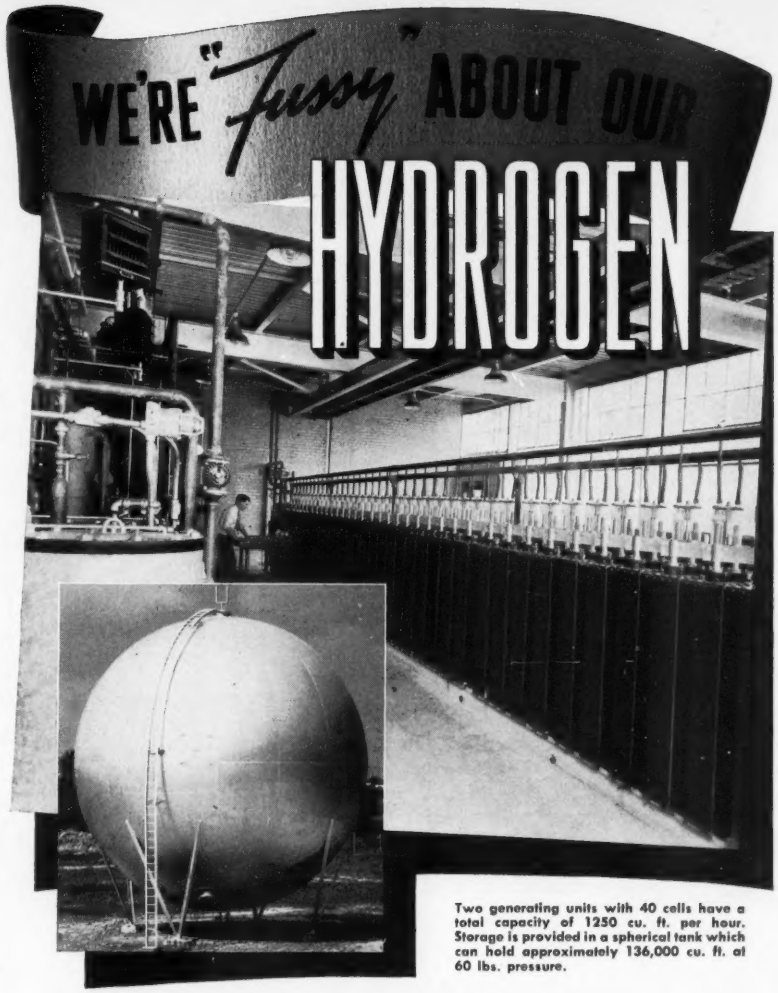
An example of the service obtained from Carboloy sheet metal draw dies is illustrated in an application at a mid-western plant. As shown below, a steel ferrule is formed in 10 passes from blank to finished ferrule.

Carboloy cemented carbide dies are used for 8 of the 10 passes. Dies have been in use continuously since April 1937, have produced 7,200,000 pieces since that time and are still operating. Carboloy die sizes in use for sheet metal drawing range up to 6″ I.D.

Many Uses For Carboloy In Form of Hollow Cylinders

Many industries having problems of rapid abrasive wear on localized areas of machine parts, tools, etc., have found numerous uses for Carboloy in the shape of hollow cylinders. A few of the many applications in use today are: Cam rollers, valve seats,

spindle bearings, ring gage and large plug gage inserts, workrest bushings, burnishing punch bushings, punch die inserts, etc. When requesting information, state sizes, probable quantities, type of job and finish required.



Two generating units with 40 cells have a total capacity of 1250 cu. ft. per hour. Storage is provided in a spherical tank which can hold approximately 136,000 cu. ft. at 60 lbs. pressure.

TO PRODUCE cemented carbide, we use hydrogen for all processes, such as carburizing, sintering, brazing, etc., requiring a non-oxidizing atmosphere in the processing furnaces.

We're "fussy" about this hydrogen—because it's one of the many "variables" that we believe can and should be controlled in the manufacture of quality cemented carbides. To accomplish this, special equipment is installed in our plant to produce hydrogen with a high degree of purification and dryness.

It's perhaps a little thing in itself—this exacting control of hydrogen. However, when combined with the many other "little" precautions taken, we believe it results in more uniform quality and extra performance in the Carboloy cemented carbide you use.

CARBOLOY COMPANY, INC., 11171 E. 8-Mile Blvd., DETROIT, MICHIGAN
CHICAGO • CLEVELAND • NEWARK • PITTSBURGH • PHILADELPHIA • WORCESTER, MASS.
Authorized Distributors: Canadian Gen. Elec. Co., Ltd., Toronto • Hartley Wire Die Co., Waterbury, Conn.

CARBOLOY
REG. U.S. PAT. OFF.

TUNGSTEN CARBIDE—TANTALUM CARBIDE—TITANIUM CARBIDE

FOR CUTTING, DRAWING, SHAPING, EXTRUDING METALS AND NON-METALLICS
★ FOR REDUCING WEAR ON EQUIPMENT OR PRODUCTS YOU USE OR MAKE ★

Send In Your Reservations NOW!

for the

Pittsburgh Regional Meeting

OF THE WIRE ASSOCIATION

which will be held at

Pittsburgh, Pa., Friday, May 17th, 1940

Headquarters and Registration will be at the William Penn Hotel

There will be no registration fee as all expenses are contributed by the Firth-Sterling Steel Company, including transportation for the plant inspection and the dinner at the William Penn Hotel preceding the evening meeting.

— THE PROGRAM —

10:30 A. M. to
1:30 P. M. — Registration at William Penn Hotel.

1:30 P. M. — Busses leave William Penn Hotel for Firth-Sterling Steel Co. plant at McKeesport, Pa.

2:30 P. M. — Tour of Firth-Sterling Steel Co. plant. Motion pictures at plant.

5:00 P. M. — Return to hotel.

6:30 P. M. — Dinner. All registered members and guests of the Wire Association and guests of the Firth-Sterling Steel Co.

8:00 P. M. — Technical Sessions—Informal 15-minute talks on current operating and production problems — Open for full discussion (all off-the-record) by:

H. L. HOPKINS, Metallurgist, National Screw & Mfg. Co., Cleveland, O.
Topic: "COLD HEADING BOLTS AND RIVETS"

R. M. HUSSEY, Superintendent, Wire Dept., Jones & Laughlin Steel Corp., Aliquippa, Pa.
Topic: "CLEANING"

L. H. WINKLER, Metallurgical Engineer, Bethlehem Steel Co., Bethlehem, Pa.
Topic: "GALVANIZING"

The plant inspection trip is limited to WIRE MILL EXECUTIVES AND OPERATING MEN who are AMERICAN CITIZENS AND WHO DO NOT REPRESENT ANY FOREIGN INTEREST.

✦ ✦ ✦

For the convenience of those who do not make the plant inspection trip Wire Association Headquarters Rooms will be open all day at the William Penn Hotel.

Reservation cards, showing birthplace and present citizenship, must be in our hands not later than May 15th, 1940. These may be obtained by addressing

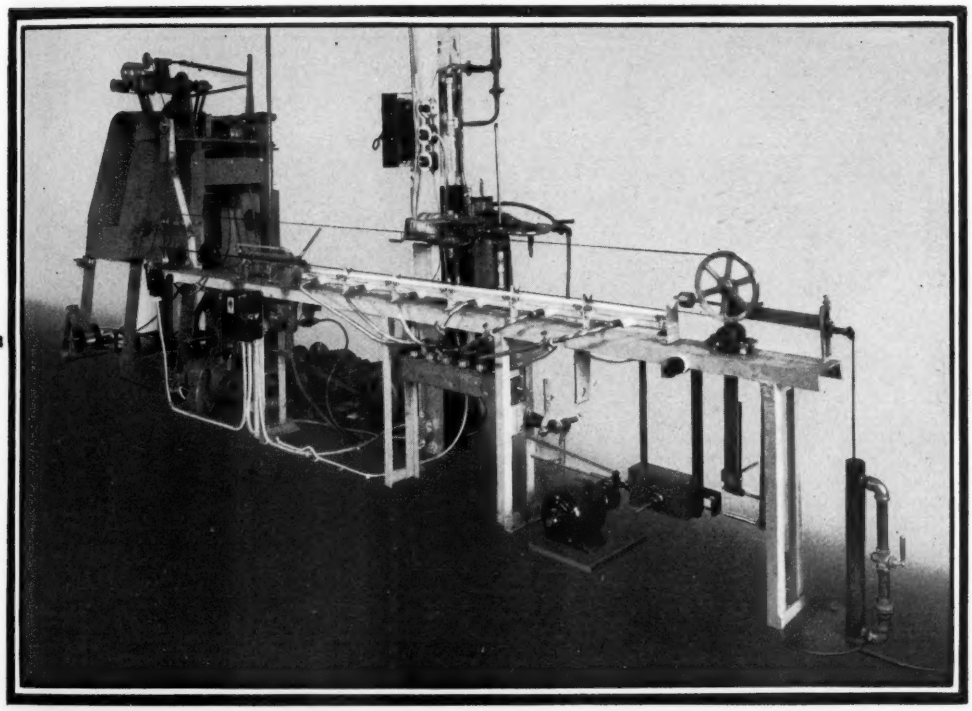
RICHARD E. BROWN, EXECUTIVE SECRETARY
THE WIRE ASSOCIATION

300 MAIN STREET STAMFORD, CONN.

Announcing

The **ELONGATROL** *ANNEALING MACHINE*

with automatic control of flame application regulated from the temperature of the wire . .



For

Annealing prior to tinning.

Annealing prior to enameling.

Annealing prior to drawing.

Annealing after drawing.

Annealing from Reels.

with

Automatic Regulation of length of flame ribbon by the ho tensile strength of the wire, and with NO LOSS of wire due t discoloration in either stopping or starting the unit.

COMPLETE BLANKETING OF WIRE IN FLAME

A new application of one of the oldest principles of metal heating.

Write, wire or phone for representative to discuss this phenomenal new annealing machine. Arrange to see a completely operating unit in service.

An Exclusive Development of

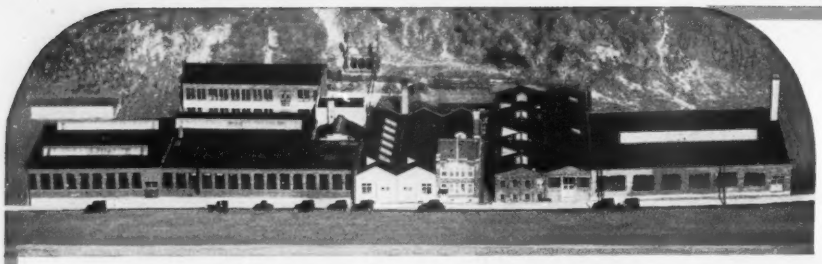
THE DREVER COMPANY

PHILADELPHIA, PA.

NOW READY FOR SALE BY THE

LEE WILSON ENGINEERING CO.

1370 Blount Street • Cleveland, Ohio



HUDSON WIRE CO. PLANT AT OSSINING, N. Y.

HUDCO

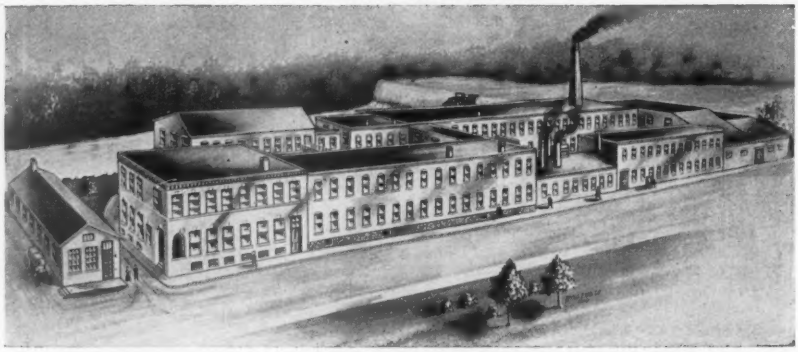
FINE WIRES IN ALL METALS

TWO MODERN AND COMPLETE WIRE PLANTS—— AT YOUR SERVICE——

LET US QUOTE ON YOUR WIRE REQUIREMENTS

WINCO

LEAKPROOF ENAMELLED WIRE



Winsted Divn. of HUDSON WIRE CO. at Winsted, Conn.

HUDCO

FINE BARE WIRES

High Brass, Low Brass, Zinc 99.99+ and High Tensile Zinc, Commercial Bronze, Phosphor Bronze, Pure Tin, Lead, Antimonial Lead, Tinsel Lahns, Silver Plated Copper, False Gold and Copper.

Cadmium, Nickel Silver, 10%, 18% and 30%; Silver Plated Copper, False Gold and Special Brass and Bronze Alloys to Specification. Metallic Fibre for Packing Purposes, Copper, Bronze, Zinc, Lead and Aluminum.

WIRES FOR METAL SPRAYING

Pure Lead, Lead Alloy, Pure Zinc, Zinc Alloy, Copper, Tin, High Brass, Low Brass, Solder Wire, High Conductivity, Electric Wire.

Cadmium, Nickel Silver, (10%, 18%, 30%); Aluminum, Monel Metal, Phosphor Bronze, Pure Nickel, Commercial Bronze.

"HUDCO" specially processed Copper Wire for enamelling purposes is drawn from Selected Copper, insuring the maximum conductivity. This is but one example of the use of the most advanced and approved materials and methods in our processing. BETTER WIRE AT LOWER COST.

LET US QUOTE

HUDSON WIRE COMPANY

OSSINING, N. Y.

SUCCESSORS ROYLE & AKIN

ESTAB. 1902 ESTAB. 1902

WINCO

LEAKPROOF ENAMELLED WIRES

Drawn from special oxygen-free copper that works so clean, so free from slivers, that enamelling is perfect. Leaks positively prevented. Every foot of WINCO enamelled wire is mercury tested before shipment to assure a wire perfect in every particular.

WINCO enamelled wire is covered to the same dimensions as fabric-covered wire so the user need not change his equipment. It will withstand softening in varnish-dipping and baking.

WINCO enamelled wire is lower in cost than silk covered wire. Write for sample.

LET US QUOTE

WINSTED DIVISION

HUDSON WIRE COMPANY

WINSTED, CONN.

MUSTANG MEETS MASTER . . .

Spring production problems meet their master, too . . . when Torrington Spring Machines are in the saddle. For faster output, for more accurately formed springs and for sustained, fault-free performance at higher speeds Torrington modern, improved equipment "has what it takes." Investigate right now what Torrington Spring Machines can do for you in stepping up profits. Your inquiry incurs no obligation . . . may show you the way to substantial savings and better-satisfied customers. Bulletins giving detailed specifications for a complete range of sizes of Segment and Clutch Type Coilers and Torsion Spring Winders will be sent on request.

THE TORRINGTON UNIVERSAL SPRING COILER PRODUCES ALL OF THE USUAL COMPRESSION AND EXTENSION SPRINGS, AND, IN ADDITION, WILL COIL MANY TYPES OF TORSION SPRINGS. A SPECIAL ATTACHMENT, WHICH IS APPLICABLE TO ALL TORRINGTON MACHINES, INCREASES PRODUCTION OF TORSION SPRINGS WITH REMARKABLE ACCURACY OF EXTENDED ENDS.

Spring Making Machines by

TORRINGTON

ENGINEERED AND MANUFACTURED BY THE TORRINGTON MANUFACTURING CO. of TORRINGTON, CONNECTICUT

THE WIRE ASSOCIATION

WHAT IT GIVES YOU FOR $10.00 ANNUAL DUES

I. WIRE & WIRE PRODUCTS — For One Year.

The official publication of The Wire Association, covering the Wire Industry; its Metallurgy, Technology, Research, Processes, Machinery and Personnel.

Regular Subscription — $5.00 in U. S.
$7.50 Foreign.

II. THE ANNUAL BUYERS GUIDE AND YEAR BOOK OF THE WIRE ASSOCIATION.

A complete Directory of the Wire Industry, with alphabetical listings of its Products, Machinery and Raw Materials. Gives the source of all Supplies and Equipment used in both the Manufacture of Wire and Rod, and Wire Products produced therefrom.

The Year Book Section contains: Constitution and By-laws of The Wire Association; Details of year's meetings, etc; List of Members, Index to Papers and Articles in WIRE AND WIRE PRODUCTS.

Regular Sales Price — $5.00.

III. QUESTION AND ANSWER SERVICE.

This extremely valuable service to members answers Technical and Operating Problems both in WIRE AND WIRE PRODUCTS, and direct by mail if desired. Available to members without charge.

IV. ANNUAL CONVENTION AND EXHIBITION.

(In Association with American Society for Metals and The National Metal Congress.) Technical Sections, Plant Inspections.

V. REGIONAL MEETINGS.

Attendance at the Pittsburgh, Pa., and Worcester, Mass. meetings which include Local Plant Inspections, Technical Sessions and Discussions.

VI. PERSONAL CONTACTS.

Both at Annual and Regional Meetings, and throughout the year, for interchange of helpful information.

VII. INFORMATION SERVICE ON MACHINERY, EQUIPMENT AND SUPPLIES.

The Technical, Catalogue and Correspondence Files of the Wire Association hold the answer to practically every "Where can I buy" problem. This service is available to members without charge.

For Detailed Information Address

RICHARD E. BROWN,
EXECUTIVE SECRETARY

STAMFORD TRUST CO. BUILDING STAMFORD, CONN.

THERE'S A BIG DIFFERENCE IN CARBIDE DIES

TANTALUM CARBIDE
Makes the Difference

The presence of Tantalum Carbide in a wire die composition does two things of fundamental importance:

1. It adds strength, which minimizes die breakage. Grades containing Tantalum Carbide are consistently stronger than corresponding grades containing only tungsten carbide.

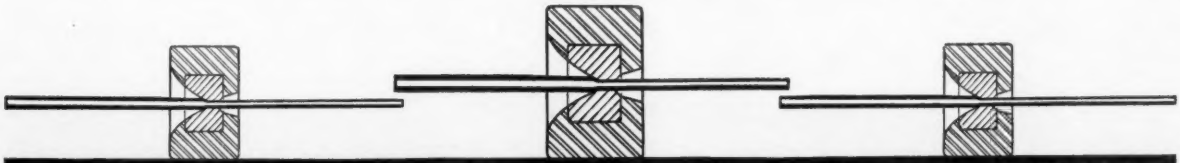
2. Tantalum Carbide imparts a peculiar self-lubricating or anti-galling property which improves the finish of the wire, minimizes rejections, saves power, adds to die life.

Dies containing Tantalum Carbide wear more smoothly, as can be proved by microscope examination. And in these dies when wire finish has become so important, you cannot afford to overlook this outstanding feature.

Many mills are proving in daily operation that Vascoloy-Ramet Dies not only draw better wire, but cost much less in the long run.

Vascoloy
RAMET
TANTALUM-TUNGSTEN CARBIDE
DIES

VASCOLOY-RAMET CORPORATION
NORTH CHICAGO, ILLINOIS
JERSEY CITY DETROIT CLEVELAND PITTSBURGH HARTFORD PROVIDENCE PHILADELPHIA
In Canada: Carbide Tool & Die Company, Ltd., Hamilton, Ont.



COP-R-DRAW TUF-DRAW FER-O-DRAW

You get it in BETHLEHEM RODS

Regardless of the size or specialized character of your order, Bethlehem can supply you promptly with rods to meet any manufacturing specification.

1. **Analysis**—Bethlehem furnishes rods in basic or acid open-hearth or Bessemer steels in a wide range of analyses.

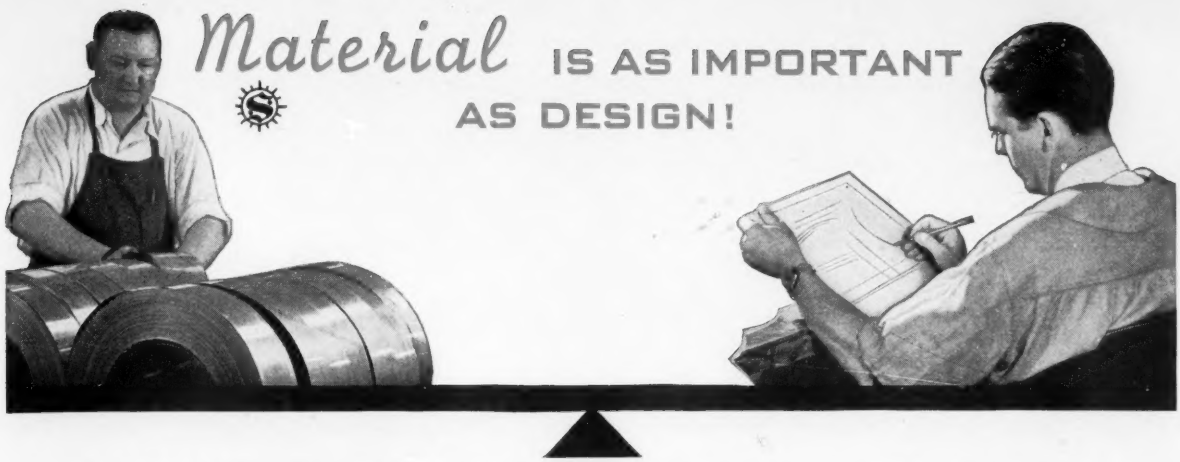
2. **Heat-treatment**—You can obtain Bethlehem rods patented, annealed, normalized or spheroidized—heat-treated to handle any job you have in mind.

3. **Finish**—In addition to the "as-rolled" condition, we furnish rods cleaned and lime-coated, cleaned and oiled.

A Bethlehem rod-and-wire engineer will be glad to make his recommendations on the rods best suited to your needs. To call him involves no obligation.

BETHLEHEM STEEL

BETHLEHEM STEEL COMPANY



IN the development of modern products—products which must meet today's sharp competition—material is just as important as design. Often it is a part of, and inseparable from, the design! Every detail of a machine or appliance should be as nearly right as it is possible to make it. To place appearance and performance at the mercy of a doubtful alloy can turn out (in the customer's hands!) to be a delusion and a snare!

Time and again over the years, product designers and those in charge of metal working shops have found it good "trouble insurance" to make vital parts of their products of Seymour Nickel Silver or Phosphor Bronze.

If you have been having trouble with the failure of some spring, cam or slide—or if the appearance of your product suffers by comparison—let us suggest that you read carefully the qualities of Seymour Nickel Silver and Phosphor Bronze as given below.

SEYMOUR NICKEL SILVER—An alloy of copper, nickel and zinc. Its even grain makes it ideal for silver plating, and its silvery white color is scarcely perceptible when exposed by wear of plate. Ideal also for other plating, especially chromium, no under plating being necessary. It is capable of a wide range of hardness, from dead soft to a lively spring temper. In its ductile stages, it is superb for deep draws and difficult spinning. When properly leaded, it machines freely. In all its forms, it is practically corrosion proof.

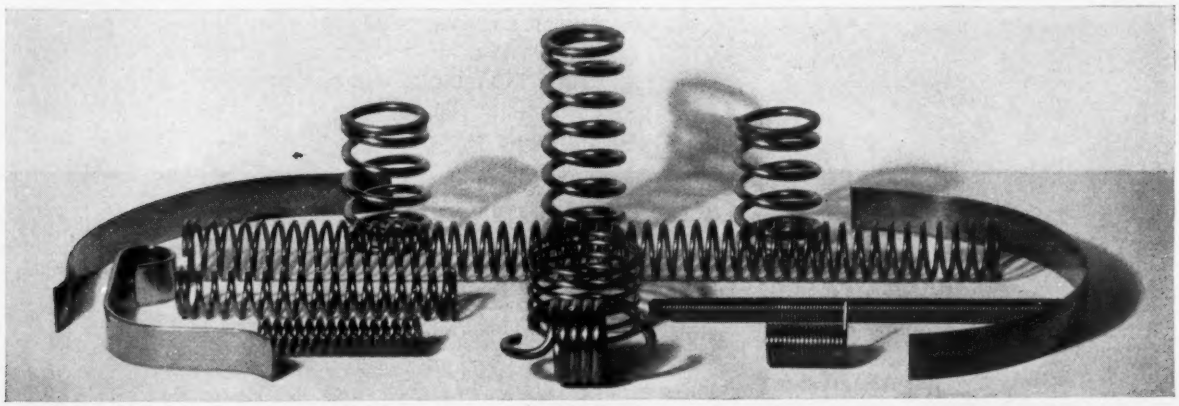
SEYMOUR PHOSPHOR BRONZE—An alloy of copper, tin and phosphorus. Principle characteristics: non-corrodibility, toughness, and extreme fatigue and friction resistance. Subject to a considerable degree of hardness—therefore excellent for springs that must stand long, constant flexure. Practically indifferent to sudden thermal change, will not "arc" when charged or spark appreciably when struck. Very free cutting when leaded. Efficient in electrical instruments, and in all devices used in damp areas.

(Test samples of either alloy on request).

SEYMOUR

SHEET - WIRE - ROD

NICKEL SILVER AND PHOSPHOR BRONZE

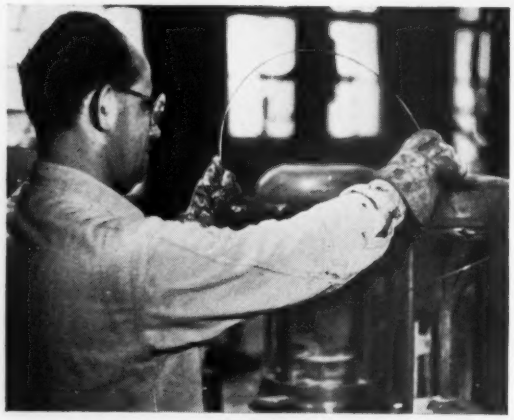


THE SEYMOUR MANUFACTURING COMPANY, 62 FRANKLIN ST., SEYMOUR, CONN.

Steel cable plays an important part in modern logging operations. This photograph, taken in Oregon, shows the use of a tractor donkey in the building of a suspension bridge.

Courtesy Caterpillar Tractor Co.

WIRE ROPE



the accent is on the Wire

RIGHT! We all recognize the importance of uniformly high quality in high carbon wire for use in wire rope. How can you make this wire — at a profit?

One sure way is to use Morgan-Connor Wire Drawing Machines. They permit rope wire to be drawn at high speed without loss of physical properties. Their exclusive high block design, combined with a highly efficient air-cooling system, result in a finished product which meets exacting specifications.

MORGAN WORCESTER ENGINEERS AND MANUFACTURERS

MORGAN CONSTRUCTION COMPANY
WORCESTER, MASSACHUSETTS, U. S. A.

- Continuous Wire Drawing Machines; Take-up Frames; Horizontal Bull Blocks; Vertical Spindle Bull Blocks; Reels; Pointers; Wire Mill Accessories.

W-48

WIRE DRAWING MACHINERY

WIRE AND WIRE PRODUCTS

A monthly publication devoted to the production of Wire, Rod and Strip, Wire and Rod Products and Insulated Wire and Cable

DRAWING—ROLLING—EXTRUDING—FORMING—FABRICATING

Vol. 15 MAY, 1940 No. 5

Designated as

Official Publication By The Wire Association

Contents

The Broad Field of Use for Cemented Carbides ..... By J. R. Longwell 249

A review of the entire field in which carbides are now applied as presented in an address before The Worcester Regional Meeting of The Wire Association.

The Worcester Meeting of The Wire Association 252

Rusting in Transit ..... By Kenneth B. Lewis 254

New Type Strand Annealer 255

The Saving in Power Achieved by Reactive Drawing ..... By H. A. Stringfellow 256

In October, 1933, Kenneth B. Lewis, predicted that back-pull would produce certain results. With the recent developments in this matter and the summary of the experiments now available and published herein, Mr. Lewis' predictions appear to be substantially verified.

Reactive Drawing Results ..... By Kenneth B. Lewis 260

A criticism of the process and an analysis of the results of Reactive Drawing as presented by H. A. Stringfellow in this issue.

Economic Trends Favorable to Revival of Bessemer Process of Steel Making 264

Exports and Imports of Wire 265

Attendance List — Worcester Regional Meeting 267

A Review of Recent Wire Patents 272

'Round the World With the Wire Industry 274

Index to Advertisers 285

Where to Buy 286-87-88

—ASSOCIATE EDITORS—

Kenneth B. Lewis, Consulting Wire Mill Engineer
W. H. Spowers, Jr., Consultant on Galvanizing
Lancaster, Allwine & Rommel, Consultants on Patent Information
European Correspondent
Paul Fidrmuc

Richard E. Brown, General Manager
R. S. Spengel, Business Manager

Publication Office: Washington, N. J.
Executive Office: Stamford Trust Co. Bldg., 300 Main St., Stamford, Conn.

Annual Subscription, U. S. $5.00, Canada $5.00

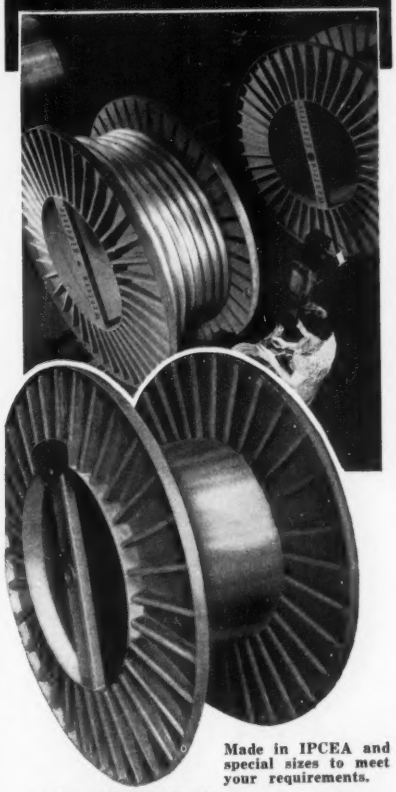
50 Cents a Copy in U. S. Issued Monthly Foreign, $7.50

October Convention Issue $1.00 a Copy
January Convention Discussions Issue $1.00 a Copy

Copyright 1940, Quinn-Brown Publishing Corp. WIRE AND WIRE PRODUCTS is fully protected by copyright and nothing that appears in it may be reprinted wholly or in part without permission.

WIRE & WIRE PRODUCTS, Vol. 15, No. 5, May, 1940, Executive Office, 300 Main St., Stamford, Conn. Published by the Quinn-Brown Publishing Corp., Richard E. Brown, President; R. S. Spengel, Secretary and Treasurer. Publication office, 13 West Church Street, Washington, N. J. Subscription price: U. S., $5.00; Canada, $5.00 per year, 50 cents per copy; Foreign, $7.50 per year. Entered as second class mail at the Post Office, Washington, N. J., under Act of March, 1879.

Stevens
LOW-TARE
Shipping Reels
and
FLANGED STEEL DRUMS



Made in IPCEA and special sizes to meet your requirements.

ALL STEEL Construction
PROVIDES
LOW WEIGHT and
LONG LIFE ECONOMIES

They are built to last—sturdy at the hub, and engineered with shock absorbing characteristics to withstand side stress. Write for interesting data and prices.

Manufactured under license arrangements with Western Electric Company, Incorporated

THE STEVENS METAL PRODUCTS CO.,
NILES, OHIO

EVERY NIB IS TESTED!

Our customers would probably be satisfied that "sample" testing is good enough . . . since any representative Firthaloy Nib, from a single homogeneous "batch" of Sintered Carbide, indicates the quality of the others. But Firth-Sterling inspectors are not permitted to be satisfied until EVERY Nib has been given Rockwell and other tests, and painstakingly checked to the closest tolerances. Then, and only then, do your Firthaloy Dies measure up to our self-imposed standards of excellence. Just another reason why Firthaloy Dies continue to break performance records wherever used!

FIRTH-STERLING FIRTHALOY QUALITY

FIRTH-STERLING STEEL COMPANY

OFFICE AND WORKS:
McKEESPORT, PA.
BRANCH WAREHOUSES:
NEW YORK CHICAGO
HARTFORD PHILADELPHIA
LOS ANGELES DAYTON
CLEVELAND DETROIT

WIRE AND WIRE PRODUCTS

A monthly publication devoted to the production of Wire, Rod and Strip. Wire Products and Insulated Wire and Cable.

DRAWING --- ROLLING --- EXTRUDING --- FORMING --- FABRICATING

Vol. 15 MAY, 1940 No. 5

The Broad Field of Use For Cemented Carbides

By J. R. Longwell,
Chief Engineer,
Carboloy Company, Inc., Detroit, Mich.

A review of the entire field in which carbides are now applied as presented in an address before The Worcester Regional Meeting of The Wire Association, April 11, 1940. ✦ ✦

CEMENTED carbide, the subject of my talk tonight, is a product of powdered metallurgy. It is one of the major products now manufactured by the technique of powder metallurgy. The process is one that is becoming of increasing importance to industry. Numerous products, made by this process, are now in use. Bronze bearings impregnated with oil sometimes called oilless bearings, are one example.

✦ ✦ ✦

ONE of the leading manufacturers in the automotive field now manufactures his oil pumps from powdered materials. Gears are made by pressing powder in steel molds and then hardened by heat treating. Powder metallurgists are constantly working with brass, bronze, and iron powders, and I venture to say that you will see quite an expansion in the number of products made by this process in the near future.

✦ ✦ ✦

IN the carbide field—which is of particular interest to us this evening, there are several types of carbides commonly known to industry. I will not dwell at length on any one type or application, but rather give a broad review of the entire field in which carbides are now applied, a word about grades available, and a few typical applications.

✦ ✦ ✦

I WILL speak on the basis of all carbides, not from the standpoint of any one make of carbide in particular, although I will draw examples from the experience of our company to illustrate various points.

✦ ✦ ✦

AS I stated before, carbides are one of the major products manufactured by the technique of powder metallurgy, and the type most widely known is tungsten carbide. To produce tungsten carbide, extremely fine carbide particles are cemented together with a binder, usually cobalt. Tungsten carbide is hard and has a high resistance to abrasion. This particular type of cemented carbide represents the greatest number of pounds consumed by industry. It forms the basis for all carbides.

✦ ✦ ✦

IN addition to tungsten carbide, we have on the market today materials commonly referred to as tantalum carbide and titanium carbide. However, the base material in the so-called tantalum grades is very largely tungsten carbide with a small percentage of tantalum carbide added. Tungsten carbide is also used as a base material to which small amounts of titanium carbide are added, giving desirable qualities to the finished carbide for certain applications. Then there are the tri-carbides, tungsten carbide with additions of both tantalum carbide and tungsten carbide. These bi-carbides and tri-carbides are largely used in the machining field for steel cutting, although there have been some instances where tungsten carbide die materials with tantalum carbide added have proved to be more satisfactory than the

straight tungsten carbide material. These tantalum carbide grades have largely been used in wet drawing such materials as pin wire and some weaving wire. A very small percentage of wire dies, however, contain any additions of tantalum.

✦ ✦ ✦

THESE bi-carbide and tri-carbide materials have been tried out in dies for drawing copper, but it is yet to be proved conclusively that they are of any particular help. Their principal use is for cutting steel and they are also used for machining certain types of alloy cast iron.

✦ ✦ ✦

IN the machining field there have been many grades of carbides offered for particular uses. We ourselves offer 13 standard grades of carbide and other manufacturers likewise offer a diversified range of grades. However, experience shows that from 80% to 90% of the carbides used for machining purposes have been confined to 4 grades of carbide. As a matter of fact, for all practical purposes in the use of carbide on cutting tools, two grades would do the majority of the work. One grade would suffice for cast iron, brass, bronze, etc. (including non-metallic materials), and another grade for steel.

✦ ✦ ✦

THE wire industry in this country has never been troubled with the necessity of selecting the correct carbide for use in wire drawing dies. Tungsten carbides were first used for wire drawing dies in Europe during the World War and by the time they were introduced here, the proper grade for dies had been arrived at, through years of experience.

✦ ✦ ✦

IN this connection, it is interesting to note that a number of years ago a test was run in the wire mill of one of the large steel companies to check the various carbides then available. In this test 39,000 tons of steel wire were drawn through carbide dies. The material drawn ran the whole gamut of steel wire, from low carbon to improved plow wire. All makes and types of carbide dies were run and an observer on each of the three shifts made certain that the records obtained were accurate. When the test was completed, it was found that the materials then in use and still in use today were the most satisfactory for wire drawing purposes.

✦ ✦ ✦

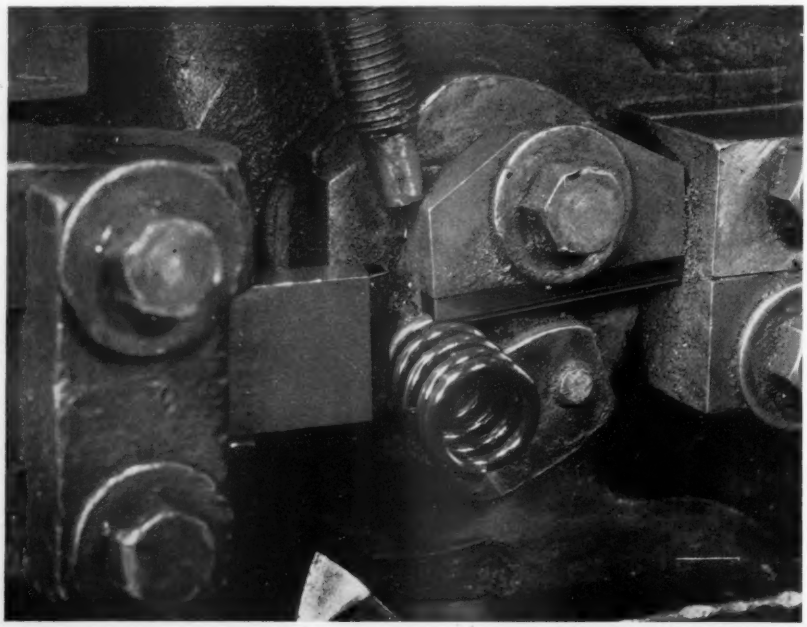
THE application of tungsten carbide to the field of wire drawing has been so thoroughly covered during the past several years that it is felt unnecessary to devote any more time to this subject.

✦ ✦ ✦

THEREFORE, let us now go on to other carbide applications, —mainly applications that take advantage of abrasion resistant qualities of carbides. The wire products manufacturer uses tungsten carbide inserts in various tools, - - - such as pitch tools, coiling points, etc., - - - employed for spring forming and other wire forming operations. The sheet metal industry uses tungsten carbide tools in the form of blanking dies, drawing dies, redrawing dies, and sizing dies. These dies are in operation today with holes as large as 6½" in diameter. For cold working operations, tungsten carbide dies are used for sizing bolts before thread rolling and during the past year there have been some dies used for cold forging, swaging and cold heading, both in the bolt and in the nail industry. In addition, manufacturers who use thin strips which must be held to close tolerances for thickness and stand close inspection for surface imperfections have used carbide rolls for rolling spring stock. For example, bronze spring stock used for dampening springs in electric meters is generally rolled between carbide rolls.

✦ ✦ ✦

CEMENTED carbides are also used for wear resistant purposes on such tools and parts as gages, guides, bushings, etc., as well as on localized areas in the form of machine parts subject to rapid wear. There is considerable thought being given today to the application of carbides to various machine parts. Various industries are today applying carbide in order to improve the quality of their product and reduce manufacturing costs. For example, in the automotive field, the grinding of cam shafts was always a considerable problem. Cam forms



These Carboloy Tipped Wire Guides saved 40-50 hours of regrinding and idle time on a run of 500,000 springs.

✦ ✦ ✦ ✦ ✦ ✦ ✦ ✦

could not always be kept uniform because of "shoe" wear. Through the application of carbides to the shoes on which the bearings of the cam shaft turn, while grinding, wear was eliminated. Precision parts made by the grinding method are no better than the centers which hold them in front of the grinding wheel. The application of carbide to grinder and lathe centers has greatly assisted the manufacturer who must hold to close tolerances. This is true on both small and large parts. We have seen gears as large as 8 feet in diameter being machined, where it was essential that the cut tooth be in correct relation to the axis of the gear and the weight of the gear itself had a tendency to wear the steel centers, making it difficult to hold to required tolerances. Carbide centers helped materially on this application.

✦ ✦ ✦

ON automatic screw machine parts, where close tolerances are held, carbide-tipped collets have been used for a great many years. In the textile field you will find guide bushings, tension devices and thread guides of various types and sizes made from carbide. Through the use of carbide it has been possible to eliminate the fraying of the thread previously due to grooves worn in steel guides and bushings. In the carpet weaving field we have needles in use with tungsten carbide inserts in the eye. Today very small bushings of carbide are being considered and built into machines handling abrasive materials. Bushings of the same type are being used as guides on fish rods. Carbide fish rod guides or eyelets have been used for over a year now in large quantities, and this use has developed so rapidly that these guide eyes or rings have been particularly standardized to a few sizes and shapes. Other uses have been found for these same rings. One of these is in the wire rope industry where carbide rings have been added to stranders. Both ends of the wire guides have had these carbide rings inserted to decrease wear and at the same time eliminate the surface of the wire becoming marred by grooves previously worn in steel guides.

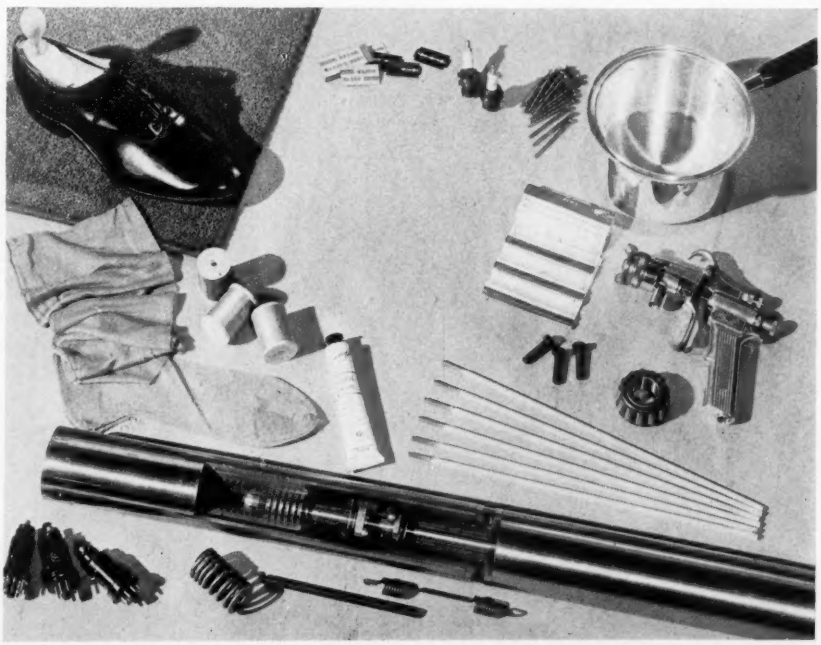
✦ ✦ ✦

AS the tolerances to which machine parts are held have been decreased, it has been necessary to eliminate wear on measuring devices used in inspection departments. Anvils and indicator points on comparators have been faced and tipped with carbide to eliminate wear and make it possible to get correct readings of size. Many firms are requiring that their comparators be able to segregate parts by tenths of thousandths and the use of carbides has helped in this work. On certain wire stapling machines, carbides have been added as anvils to clinch the wire after it passes through the material being stapled. Even accounting departments make use of carbides. Card sorting machines have fingers tipped with carbide in order to make sure that the sorting is accurately done for long periods of time. When steel fingers were used, slight wear allowed two cards to pass through instead of one. This was eliminated by adding carbide tips to the fingers. Valve seats and valves are made from carbides where abrasive materials have to be handled. This includes both needle valve and ball type valve. Ball type check valve balls and seats are carbide. Carbide shredder knives have been applied in the electric pig or disposal unit which handles garbage including paper and bones, to increase its life and eliminate trouble originally associated with the shredding of bones and other hard matter. Carbide plays a part in the slicing of bread. Bread slicing knives have to be guided, and steel guides and hard-faced guides wore rapidly producing uneven slices. Thousands of carbide inserts have been placed in bread slicer guides and are in daily use, outwearing previous materials many times over.

✦ ✦ ✦

IN some high pressure units used today, it was found that the cylinders and pistons would wear, making it impossible to hold the high pressures desired. Carbide cylinder liners and pistons remedied this trouble. This is not a common application, but it is one which has helped a manufacturer eliminate a great deal of down time on his apparatus. In the precision machining field where close tolerances have to be held, both cams and cam followers have

(*Please turn to Page 271*)



Typical of the broad use of cemented carbides are these diversified products on which Carboloy is used during the manufacturing process. ✦ ✦ ✦ ✦ ✦

The Worcester Meeting of The Wire Association

WITH a total registration of 138 members and guests, attendance at the 1940 Worcester Regional Meeting was drawn from an area ranging as far south as Maryland, as far west as Cleveland, and up into Canada.

✦ ✦ ✦

The Plant Inspection

THE feature of the meeting was the plant inspection at the South Works of the American Steel & Wire Company. Here, the steel mills were seen, including soaking pits, blooming mill, billet mill, re-heating furnace, and continuous rod mill, all in operation. The open hearth floor and pit were visited, and charging operations observed.

✦ ✦ ✦

The Austempering Unit

THE trip then led to the new Austempering equipment, a description and demonstration of which was given by the technical staff. The principle of the Austempering treatment is the quenching of metal parts into a molten salt which is held at some suitable temperature such as 600°. The prime factor in this treatment is the length of time the work is held in this salt bath. The actual time depends on the temperature, being about 1 hour at 600°, and 2 hours at 500°. The purpose of this long soak is to secure full transformation of the steel, the resulting structure giving very high hardness together with unusual ductility.

✦ ✦ ✦

PHYSICALLY, the unit consists of a heating furnace 10-12′ long, a salt bath 30′ long, and washing and drying mechanisms for cleaning the work. A great deal of time and money have been put into the development of this process, including much research at the U. S. Steel Research laboratories at Kearney, N. J. The process has now been brought to perfection for the treatment of small parts, such as lock washers, cotter pins, Belleville springs, cutlery, and many more small and medium sized wire forms.

✦ ✦ ✦

The Meeting

THE meeting continued at 6:30 with a steak dinner at Putnam & Thurston's restaurant, where 115 who had survived the plant trip gathered. Following dinner, President J. K. Beeson extended greetings to the group, and commended the spirit of co-operation which has led to the fine position the Wire Association occupies at the present time. Secretary R. E. Brown spoke briefly on Association activities. Rodman R. Tatnall of Wickwire Spencer Steel Company presided.

✦ ✦ ✦

THE photograph shows the Speaker's Table at the meeting. From left to right, those sitting at the table are:

S. L. Ekstrom, New England High Carbon Wire Company. Worcester Committee.
K. R. Beardslee, Carboloy Company.
R. E. Brown, The Wire Association.
J. K. Beeson, Pittsburgh Steel Company. President of the Wire Association (Standing).
R. R. Tatnall, Wickwire Spencer Steel Company. Chairman, Worcester Committee.
J. R. Longwell, Carboloy Company. Speaker of the Evening.
E. H. Thomas, Geo. W. Prentiss & Company. Worcester Committee.
Eugene Roth, Carboloy Company, Tech. Chairman, Worcester Committee.

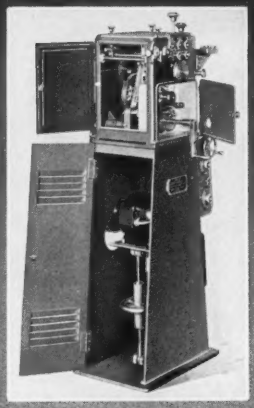
✦ ✦ ✦

FOLLOWING the dinner, the meeting was turned over to Technical Chairman Eugene Roth of the Carboloy Company, who introduced the speaker of the evening, J. R. Longwell, Chief Engineer of the Carboloy Company. Mr. Longwell presented an excellent discussion on new developments in tungsten carbide,

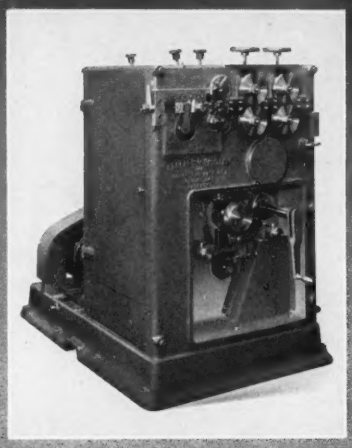
(*Please turn to Page 267*)

CHECKS ✓ *that* DON'T BOUNCE!

No. 1 Series 666
48" Model



No. 0 Series 668
24" Model



No. 2 Series 667
64" Model

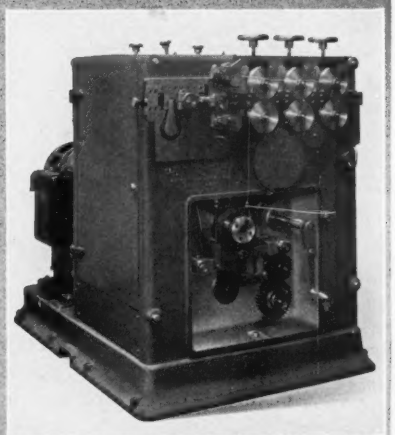
"UNIVERSAL" SPRING COILERS *(Patented)*

DISTINCTIVE FEATURES

- ✓ Pitch and Diameter Cams and Compound levers are located in recess of front housing.
- ✓ Increased production.
- ✓ Auxiliary Gearing to increase wire length per spring.
- ✓ Quality production.
- ✓ Longer Wire Feed.
- ✓ Heavier Wire Range.
- ✓ Alloy Steel Tools.
- ✓ Anti Friction Bearings.

Simplicity of Adjustment.

- ✓ Speed consistent with Accuracy.
- ✓ Heavier and more rugged construction.
- ✓ Morse Recoil Clutch.
- ✓ Morse Free Wheeling Feed Clutch.
- ✓ Tools interchangeable with older models.
- ✓ Pitch and Diameter Cams may be shaped and timed on the Cam Hub, for special springs, and the entire unit removed.
- ✓ One-piece cams can be used on this removable cam hub if desired.



No. 2½ Series 669
72" Model

SLEEPER & HARTLEY, Inc.

DESIGNERS AND BUILDERS

WORCESTER, MASSACHUSETTS, U. S. A.

Rusting In Transit

(Translated from "Draht-Welt")

By Kenneth B. Lewis,
Consulting Wire Mill Engineer,
Worcester, Mass.

ATMOSPHERIC air always carries water in solution in the form of an invisible vapor. The capacity of air for water vapor depends upon its temperature; the higher the temperature the more water it can carry, and air which is carrying the greatest amount of water possible at its temperature is called saturated. The following, for example, are the amounts of moisture in grams per cubic meter which saturate air at the indicated Centrigrade temperatures.

C. degrees	Am't Water
0°	4.87
10°	9.35
15°	12.74
30°	30.08

✦ ✦ ✦

IT will be obvious that air cannot be dried by heating it; indeed, heating air only increases its ability to absorb more water from any available source, and is therefore more apt to make it wetter than drier. Cooling, however, dries the air. If saturated air at 30° C. is cooled to 15° C., its moisture content drops from 30.08 grams per cubic meter to 12.74. From each cubic meter of such air about 17 grams of water are removed, by condensation in the form of dew.

✦ ✦ ✦

A BUNDLE of wire is by no means a solid mass of metal. It contains a large number of voids, whose area can be calculated, and which are filled with air of the same composition as the atmosphere in the room where the bundle was tied up. This air is to a large degree sealed off from the ambient atmosphere in small three-cornered passages.

✦ ✦ ✦

NOW here is an entirely possible situation in summertime. Wire is drawn in a room at 30° C. (86°F.) and 100% humidity. While this may be unusual it is not impossible; at any rate it would be quite common to find the humidity 80% in temperate climates in summer, with a consequent 24 grams of dissolved water per cubic meter. Air with this moisture content would fill the numerous voids between strands in the bundled wire.

✦ ✦ ✦

THIS wire goes to the warehouse, and there is a sudden change in the weather, a drop of temperature to 15° C. (60°F.). The air trapped in the voids also cools down, more or less quickly, dependent on the sort of protection afforded the warehouse against outside weather changes. The inevitable result is that the capacity of the air to retain moisture drops from 24 to 13 grams, the excess falling out as dew, and rusting the wire which bounds the voids in the bundle. The outer strands are usually freed of moisture by air currents, but for the inner strands there is no possible escape. The condensate wets the inner strands and they rust. This explains why bundles may be perfectly dry and bright on the outside, and wet and rusted inside.

✦ ✦ ✦

IT is also clear why wire is more apt to rust in transit or in the buyer's stock than in the mill warehouse. At the mill it is stacked in large masses which react so slowly to temperature changes that subsequent changes in the opposite direction may keep it practically in balance. But in transit or at the buyer's plant, handled repeatedly as single bundles it responds much more quickly to changes in ambient temperature.

✦ ✦ ✦

THIS explanation also shows why counter measures are practically ineffective. It would be possible to slush the wire so heavily that no voids were present in the bundle, but this would almost certainly interfere with manufacturing operations. Atmosphere control would seem to be an effective counter measure, but it would be effective only as long as the wire was under the control of the mill. Even the sealing of wire in galvanized containers, as for export, is ineffective in view of the fact that air containing moisture is necessarily sealed into the container with the wire and into the voids as well. The inclusion of hygroscopic material in such a container would dry the air surrounding the wire, but could not affect the air voids in the bundle, with which it has no communication.

✦ ✦ ✦

IT is true that a similar though somewhat different phenomenon affects pot annealed wire, but we shall not go into that in detail.

✦ ✦ ✦

WHEN rusty wire becomes a cause of controversy between the manufacturer and the buyer, the most fantastic causes are assigned, such as failure to bake out acid, presence of acid fumes in the warehouse, the use of cars which have previously held corrosive substances, or even the presence of chemical works in the neighborhood of the wire mill. The real reason is just as simple as the fall of dew in the evening.

✦ ✦ ✦

SO far as the wire manufacturer is concerned, rusting of wire in transit is an Act of God in the fullest sense of the words. Seller and buyer should respect each other's viewpoints, but the seller is fully justified in making a disclaimer of responsibility for rusting in transit a part of standard specifications.

✦ ✦ ✦

AS will be clear from a consideration of the phenomenon, rust-

(*Please turn to Page 284*)

New Type Strand Annealer

Unit with automatic control of flame length and height from desired tensile strength now available. ✦ ✦ ✦ ✦

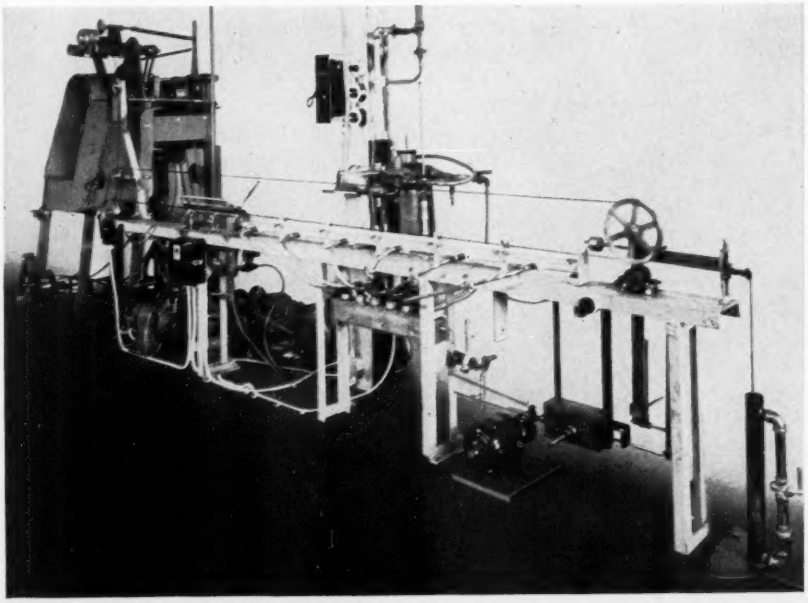
IN this issue of the magazine the announcement is made of the new flame annealing machine for copper and brass wire which has been developed by the Drever Company of Philadelphia and is to be sold by the Lee Wilson Engineering Company of Cleveland.

✦ ✦ ✦

WHILE this machine utilizes a well-known principle of ribbon flame burners with a premixture of fuel and air to definite combustion ratios, the unique principle incorporated in the design is the automatic control of the quantity of combustion according to the desired tensile strength of the wire after annealing.

✦ ✦ ✦

THE photograph below shows an installation of this new annealing machine which is to be known to the trade as the **Elongatrol Annealer.** This is a compound name based on the function of the control from an exact elongation of the wire during the annealing process. This particular installation is one in which drawn wire on reels is annealed and re-reeled after annealing. The path of the wire can be observed in leaving the supply reel passing over the guide reel and around the supply capstan, and then passing horizontally to the calibrating or control sheave. From there the wire passes back through the series of ribbon burners and around the take up capstan and thence to the reeling take-up.



✦ ✦ ✦

THE length of the unit and the number of burners depends on the desired production, but regardless of the number of burners each is under full automatic control as to when they are turned on and as to the height of the flame. The operation of the equipment is based on having a definite tensile stress set up in the wire while it is being heated by having the calibrating sheave mounted on a pivoted arm which can be counterweighted to produce the exact stress desired. The weight varies according to the final degree of annealing and the gauge of the wire being annealed.

✦ ✦ ✦

THE movement of the control sheave is transferred to a special type control valve which regulates the number of burners which are lighted and also the flame height of the last burner. The burners light in succession from pilot flames, starting at the end of the line nearest to the quenching tube. As the flame is lengthened and shortened by the controller in direct proportion to the heat requirements of the strand, no discoloration or variation of anneal occurs during starting and stopping for reel changes.

✦ ✦ ✦

THE photograph shows a single line annealing unit, but, of course, the equipment can be provided for multiple line units in as many lanes as might be desired. The Elongatrol machine is entirely suitable for combination with tinning and enameling lines, for preheating for tinning operations to increase the speed of the wire being tinned, for cleaning and conditioning the wire for further processing, and for combination with drawing machinery.

✦ ✦ ✦

THE path of the wire through the flame is such that as long as the wire is moving, the part passing through the flame cannot possibly be in contact with the atmosphere before it is quenched in the cooling tube. As the wire leaves this cooling arrangement it is warm enough to immediately dry the wire before it is re-reeled, in-

(*Please turn to Page 277*)

The Saving In Power Achieved By Reactive Drawing

By H. A. Stringfellow,
Worcester, Mass.

In October, 1933, Kenneth B. Lewis predicted that back-pull would produce certain results. With the recent developments in this matter and the summary of the experiments now available and published herein, Mr. Lewis' predictions appear to be substantially verified. ✦ ✦ ✦ ✦ Before publishing, the article was submitted to Mr. Lewis for criticism and comment, and immediately following Mr. Stringfellow's summary the reader will find a criticism and analysis of Mr. Stringfellow's conclusions as Mr. Lewis sees them. ✦ ✦ ✦

DURING the past six months, I have had the good fortune to have available, for experimental purposes, a back pull wire drawing machine equipped with die pressure indicating devices, speed controlling mechanisms and means to vary the percentage of back pull in certain predetermined ratios.

✦ ✦ ✦

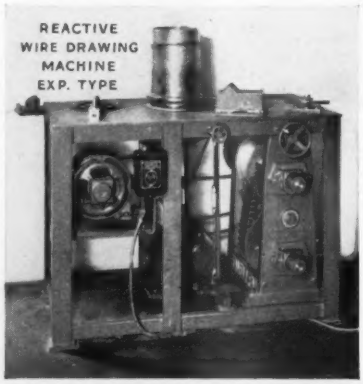
THIS machine is built under the Smith - Stringfellow patents and is designed with differential gearing interposed between the pull block and the pull back block. Hence, the term "Reactive" Wire Drawing Machine sprang naturally into being, since all work done may be defined as the algebraic sum of the reactions between the opposing gear teeth.

✦ ✦ ✦

FOR the benefit of those who have not seen the machine, it can be concisely described as consisting of a vertical shaft to which the upper bevel gear of the differential is keyed; the pull block carries four pinions which mesh with the upper bevel gear and with the lower bevel gear of the differential, which latter is free to rotate about the shaft and to which the pull back block is secured. Rotation of the shaft and the upper gear causes the pull block to revolve in the same direction. At the same time, the lower gear, carrying the pull back block, attempts to rotate in a direction opposite to that of the upper gear and pull block with a torque equal to one half of the torque of the pull block. As the wire is strung around the pull back block and is moving in the same direction as the pull block, the wire forces the pull back block forward against a reactance equal to one half of the torque of the pull block and thus creates the back pull. By placing rings of different diameters on the hub of the pull back block, different ratios of back pull to forward pull are secured and this ratio is termed the pull ratio at which a draft is made.

✦ ✦ ✦

IT is evident that the amount of the back pull is always dependent upon the torque of the pull block at any moment which, in turn, is dependent upon the die pressure. Any change in the die pressure will, in turn, change the torque of the pull block and, consequently, the back thrust of the lower gear and pull back block, leaving the pull ratio undisturbed. The back pull is at all times a definite proportion of the reaction of the drawing pull.



REACTIVE WIRE DRAWING MACHINE EXP. TYPE

✦ ✦ ✦

THE above will suffice to distinguish Reactive Drawing from back pull drawing as it is ordinarily conceived. In Reactive Drawing a live pull is maintained behind the die, subject to the beck and call of the pulling force acting ahead of the die.

✦ ✦ ✦

WITHOUT going further into the characteristics of differential gearing, it is evident that the action of a machine so constructed will be different from that of one which carries a dead load back of the die, or one which uses the back pull, as in a continuous design, to draw wire through a preceding die; because, in the Reactive Machine, the back pull is controlled by the pulling force exerted ahead of the die and by nothing else.

✦ ✦ ✦

THIS is the first time, to my knowledge, that it has been possible to make comparative determinations of the relative consumption of power required by back pull and conventional drawing, on the same machine, through the same die, with the same lubricant, on the same wire, and with the ability to vary the speed of drawing and the pull ratio within extreme limits.

✦ ✦ ✦

THE power determinations which I have made are accurate for

the Reactive Wire Drawing Machine and, I believe, reasonably so for those back pull wire drawing machines which have regenerative capacity, provided the efficiency of regeneration is sufficiently high.

✦ ✦ ✦

ALL readings were reduced to kilowatt consumption per foot of wire drawn, after deducting machine losses. As all speeds are in feet per minute, the results actually represent kilowatt minutes per foot of wire. This reduction to power consumption per foot of wire eliminates all effects of speed and comparative results are secured.

✦ ✦ ✦

SPEED variation, in this particular machine, is secured by means of a Lewellen variable speed unit. Two runs were made to determine the machine losses with no wire in the machine; one with the pull block and pull back block in the same condition as during Reactive Drawing, and the other with the blocks in the condition obtaining during conventional drawing. Determinations were made at four different settings of the Lewellen unit and these settings were used during all tests runs, in order to keep the machine losses at known amounts. This accounts for the difference in the speeds reported for Reactive and conventional drawing; as a given r.p.m. of the driving shaft will result in different pull block speeds for the two types of drawing. The speed, when drawing Reactively, is affected by the elongation of the wire, which is not the case in conventional drawing.

✦ ✦ ✦

REFERRING to the accompanying figures: Fig. 1 is a photograph of a portion of the watt meter record covering a portion of the tests made, including a portion of the tests made to determine machine losses. Fig. 2 shows an analysis of one of the tests shown on the photographic record. Fig. 3 is a tabulation of comparative tests made on a .63 Carbon wire.

✦ ✦ ✦

THE average of twenty-four determinations made on the .63 Carbon wire showed that conventional drawing required 0.0074 kilowatt minutes of power per foot of wire drawn, while Reactive Drawing required only 0.0068 kilowatt minutes per foot of wire drawn through the same reductions and under the same conditions.

✦ ✦ ✦

ON the basis of these determinations, Reactive Drawing shows a saving in power of 8.10% over conventional drawing.

✦ ✦ ✦

IT is interesting to note that, when drawing with a 50% pull ratio the saving in power is 12.15%, while with a 31% pull ratio this saving drops to 5.40%. This demonstrates that the power saving is an inverse function of the pull ratio. As a 50% pull ratio is the heaviest that would probably be ordinarily used in practice and 31% the lightest, the above averages cover the entire field of practical operating conditions.

✦ ✦ ✦

IT is also interesting to note that, with the same pull ratio, the power saving is an inverse function of the reduction taken, the lighter reductions showing a greater power saving than the heavy reductions. For example, using a 50% pull ratio, the saving in power with a 24% reduction is 5.90%, while with an 8% reduction this saving is 10.8%. This was to be expected, because the lighter reductions produce smaller elongations.

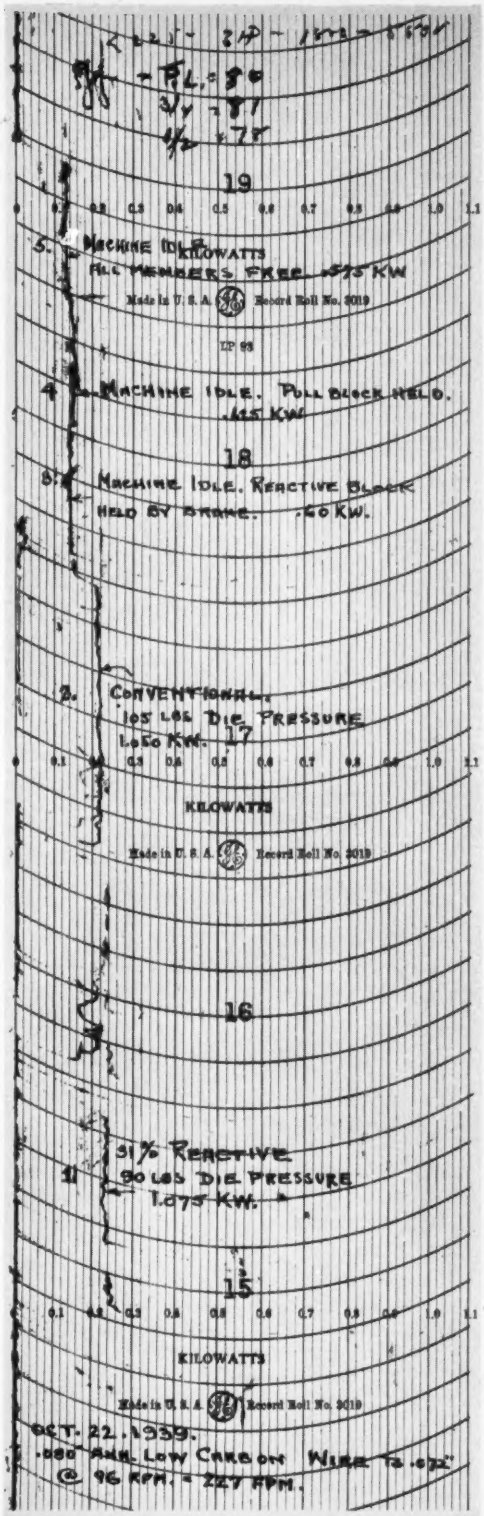


Fig. 1

Fig. 2

.06 C. Wire Annealed at .080" Dia.

Draft .080"-.072" : 19% Reduction

Conventional Drawing					Reactive Drawing : 31% Pull Ratio				
Meter K. W.	Losses K. W.	Net K. W.	Wire Speed Ft. Min.	K. W. Min. Per Ft.	Meter K. W.	Losses K. W.	Net K. W.	Wire Speed Ft. Min.	K. W. Min. Per Ft.
1.050	.600	.450	114	.0040	1.075	.575	.500	203	.0025

Fig. 3

.63 C. Swedish Steel Air Patented in No. 5 Rod at 1700°F.: Drawn 5 drafts to .135" and Lead Patented at 1569° - 975°F.: Drawn 3 drafts to .080" and Pot Annealed at 1330°F.

Draft .080"-.072" : 19% Reduction

Conventional Drawing					Reactive Drawing : 31% Pull Ratio				
Meter K. W.	Losses K. W.	Net K. W.	Wire Speed Ft. Min.	K. W. Min. Per Ft.	Meter K. W.	Losses K. W.	Net K. W.	Wire Speed Ft. Min.	K. W. Min. Per Ft.
.875	.510	.365	52	.0070	1.100	.490	.610	92	.0067
1.130	.540	.590	80	.0074	1.500	.520	.980	144	.0068
1.570	.600	.970	118	.0082	2.050	.575	1.475	212	.0070
2.200	.720	1.480	165	.0090	2.850	.690	2.160	295	.0073

Draft .069"-.060" : 24% Reduction

Conventional Drawing					Reactive Drawing : 50% Pull Ratio				
Meter K. W.	Losses K. W.	Net K. W.	Wire Speed Ft. Min.	K. W. Min. Per Ft.	Meter K. W.	Losses K. W.	Net K. W.	Wire Speed Ft. Min.	K. W. Min. Per Ft.
.825	.510	.315	52	.0061	1.025	.490	.535	90	.0060
1.060	.540	.520	80	.0065	1.350	.520	.830	139	.0060
1.425	.600	.825	118	.0070	1.850	.575	1.275	203	.0063
2.000	.720	1.280	165	.0077	2.750	.690	2.060	283	.0073

THE basis of the calculations leading to the above results, and the proof of the accuracy of these results is contained in the following paragraphs:

✦ ✦ ✦

BECAUSE of the characteristics of differential gearing and also, because of the fact that the wire between the pull back block and the pull block is subject to the elongation produced by the die, the relation between the speed of the driving shaft and the speed of the pull block must be expressed as a proportion, corrected for elongation. Also, because the internal speed and torque ratio of any differential gear is 2 to 1, the elongation must divide itself equally between the pull block and the pull back block, causing the pull block to increase, and the pull back block to decrease relatively in speed.

✦ ✦ ✦

THEREFORE, calling "S" the speed of the driving shaft in r.p.m., "P" the speed of the pull block in r.p.m., "E" the elongation, and "R" the speed of the pull back block in r.p.m., the following relations are true:

(1) $S/P + E/2 = P$
(2) $S/P - E/2 = R$

Subtracting (2) from (1): $2E/2 = P - R$ which reduces to $E = E$, which proves the analysis to be correct.

Let r represent the reduction taken and %r the percentage reduction:

(3) Then: $1/P = (100 - \%r)$
(4) Substituting (3) in (1): $S(100 - \%r) + E/2 = P$
(5) Now: $E = [100/(1 - \%r)] - 100$

Substituting (5) in (4) and simplifying:

(6) $P = 2S\ (1 - \%r)/(2 - \%r)$

Equation (6) is the basic equation for determining the drawing speed of the Reactive Machine, knowing the speed of the driving shaft.

✦ ✦ ✦

THE question of torque on the pull block must next be considered.

In this analysis the following notation is used:

R = radius of pull block
H = back pull plus die pressure
B = back pull
K = pull ratio
d = diameter of pull back block
W = torque on driving shaft

Note: The factor R/d is the pull ratio, as previously explained. Otherwise expressed, it is the ratio of tyice the torque of the pull back block to the torque of the pull block (because of the 2 to 1 inherent ratio of a differential gear). It is always expressed as a percentage.

Because the internal torque ratio of any differential gear is 2 to 1, the following relations are true:

(7) $W = (RH/2 + RB/K)/2$
(8) $W = RH/4 + RB/2K$

Equation (8) is the basic equation for determining the torque of the Reactive Machine.

Note: The quantities R/2 and R/4 are constants for any particular machine as they depend only upon the diameter of the pull block.

✦ ✦ ✦

CONSIDER now the determinations reported in the table, Fig. 2. The reactive die pressure, during this run, was 90 lbs. and the speed of the driving shaft was 96 r.p.m. As this determination was made at a pull ratio of 31%, the back pull was 40.5 lbs. and the total pull between the die and the pull block was 130.5 lbs. This particular experimental machine has a pull block 9″ in diameter, which corresponds to a circumference of 2.36′.

Inserting these figures in the above equations:

$W = 4.5(130.5)/4 + 4.5(40.5)/2(.31)$
$W = 441''\#$
H.P. $= 96(441)/63025 = .670$
$P = 2(96 \times 2.36).81/1.81$
$P = 202.5'$ per min.
H.P. per ft. $= .670/202.5 = .0033$
Kilowatt minutes per ft. $= .0033 \times .746 = .002462$

The kilowatt minutes per foot, as determined from the meter readings and reported in the table, Fig. 2, are .0025.

✦ ✦ ✦

THE above, therefore, is a check upon this particular determination and upon the method and calculations used in making these power determinations. The complete record of these determinations is open to the inspection of any interested person at any time.

✦ ✦ ✦

THIS investigation could profitably be carried further by any laboratory, or research organization, properly equipped for such work, as much remains to be done along the lines outlined in these determinations. Much greater savings in power may be possible by properly applying Reactive methods, to particular problems.

✦ ✦ ✦

IT is interesting to note that the results reported here check, generally, the conclusions arrived at by Mr. Kenneth B. Lewis in his article in Wire and Wire Products of Oct. 1933. Mr. Lewis, as a pioneer in this work, was far ahead of his time.

✦ ✦ ✦

THE dies used in these tests were "Firthaloy", furnished by the Firth-Sterling Steel Co. The lubricant used was No. 99 Wire Draw Soap Compound, furnished by the Standard Industrial Compounds Co.

✦ ✦ ✦

I ALSO wish to express my appreciation to the General Electric Co., who supplied recording and polyphase watt meters, other equipment and the services of an experienced electrical testing engineer, who had charge of all electrical work involved in these tests.

✦ ✦ ✦

THE subject is a very complicated one. I will return to the discussion of other factors in a subsequent issue.

The comments and criticisms of Kenneth B. Lewis, consulting wire mill engineer on the above conclusions will be found on the pages immediately following. ✦ ✦ ✦

Reactive Drawing Results

By Kenneth B. Lewis,
Consulting Wire Mill Engineer,
Worcester, Mass.

A criticism of the process and analysis of the results of reactive drawing as presented by H. A. Stringfellow in this issue of Wire and Wire Products.

Editor Wire and Wire Products
Dear Sir:

IT was very gracious of you and Mr. Stringfellow to allow me a preview and an opportunity to comment on his article on reactive drawing. It was in your mind, no doubt, that since I have been in touch with this back-pull problem for some years I ought to have at my fingers' ends all means for checking these complicated relationships and correctly appraising the very simple and ingenious method covered by the Stringfellow patent. This is true in a measure, but it is also true that I have not the mathematical type of mind, and I find the matter very elusive. I am one of those fellows who locate water with a divining rod, but expect others to set up the drill rig.

✦ ✦ ✦

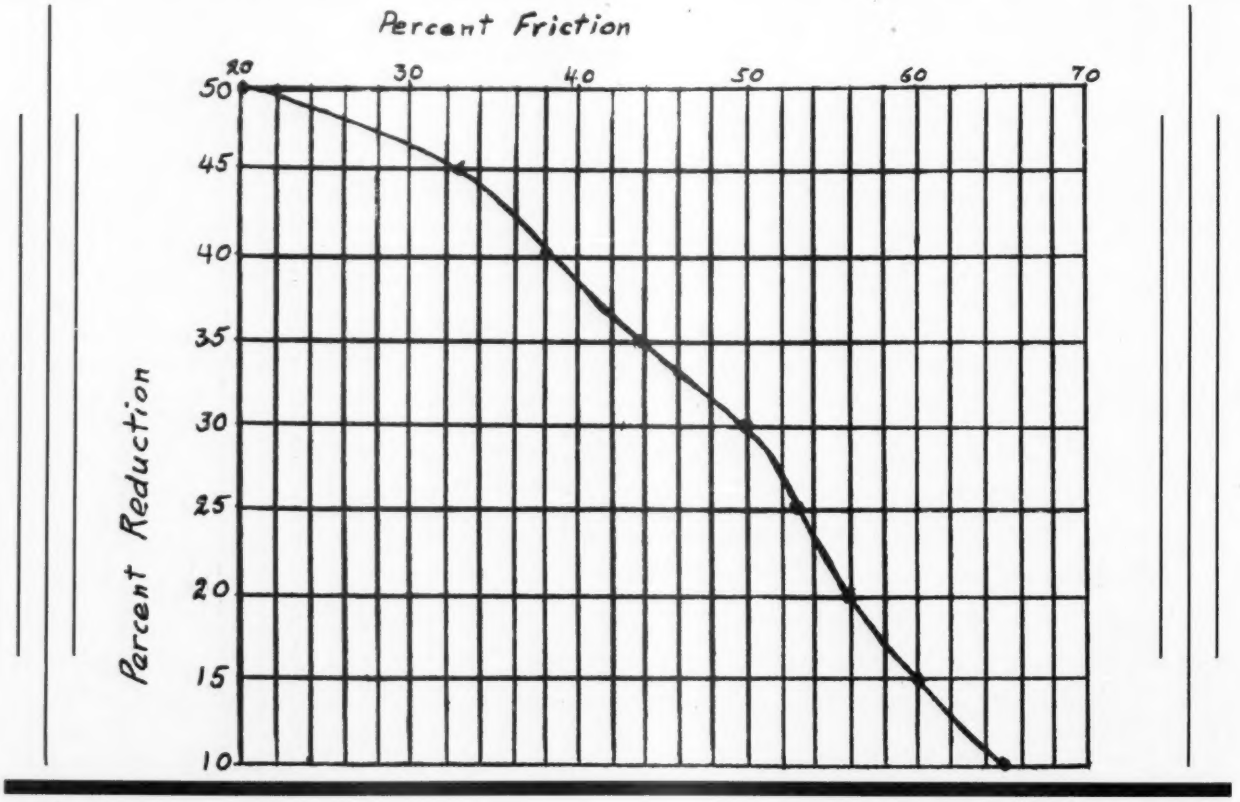
SOME of the relationships are hard for me to keep in mind. I have watched the reactive machine in operation. I know that its parts behave as stated, but it is not easy for me to keep constantly in mind a clear picture of the interrelations of the two working surfaces. Differential gears have always been slippery things to me. Nevertheless, since it takes force to stress a wire, I presume it takes power to keep a running strand constantly stressed, and I will not deny that with blocks of equal diameter the back stress is equal to the pressure on the die. I am also ready to concede that the prestressing is done without loss of power except for the infinitely small drag of the snubber.

✦ ✦ ✦

I HAVE prepared calculations to check the power savings reported, and they are interesting though erratic.

✦ ✦ ✦

I HAVE always been convinced that back pull could not effect the power required to deform the



wire, since the pre-stressing of the wire would take exactly as much power as it saved. Any saving in power will be, in my view, in friction between wire and die. This is no mean target to shoot at, since die friction averages at least 50% of the die pull. I attach a chart showing the percentage of power absorbed in friction in drafts of varying degree, with dry soap lubrication. This chart is made from many hundreds of determinations, and checks closely with the one prepared by John Brunton and published in these columns some years ago.

✦ ✦ ✦

THE die friction depends on yield point of the metal, area of contact, and coefficient of friction. The yield point of course determines unit pressure in the die, and directly affects friction. Note, however, that since friction acts only in the die, the significant yield point is only that part of yield stress which acts **in the die.** If the wire comes into the die stressed to half its yield point, friction will be reduced by one half, since half the work of stressing has been done elsewhere, and without frictional contact. It is on this principle that I have based my figures.

✦ ✦ ✦

MR. Stringfellow's examples can readily be re-figured to put KW per minute into pounds die pull. Reference to the chart will show pretty accurately how many of these pounds are friction. From the history of the samples it is not difficult to assign to each a fairly accurate yield point at the die, and we know in each case how many pounds back pull have been applied, and to what section. From this data I have figured in each case the total friction, the amount of friction that should have been saved by the reactive effect, and the amount which actually was saved, as shown by the meter. Here is the summary in Table I.

IT seems a little ungracious to ask Mr. Stringfellow why he didn't save more power. I feel like the woman whose little boy was saved from drowning. She pushed her way through the crowd shouting "where's the man who saved my little boy's life?" "I am he", modestly said the dripping hero. "Well", she said, "what did you do with his hat?" But I would still like to know what they did with his hat.

✦ ✦ ✦

THE only assumption in my figures which can affect the result is my guess on yield point, and in two of these cases an adjustment of my guess sufficient to square the result would give fantastic figures, in fact, 480,000 psi for the Swedish and 12,000 psi for the basic. Another dismaying fact is that in these three calculations we have (1) a close one, (2) a rank failure to come near the possible savings, and (3) a saving of 62% more than should have been possible.

✦ ✦ ✦

WHAT explanation can be offered for these discrepancies? Well, we know that our formulas and theories as to plastic flow in the die are imperfect, or perhaps it is more accurate to say that while the formulas are correct we don't know how to assess the physical data on which they depend. Yield point and coefficient of friction are subject to fluctuations that are as yet not wholly accountable. We know that in an annealed wire some grains are favorably oriented for plastic flow, some less favorably, and others are nearly on "dead center". These grains gradually re-align themselves as drafting proceeds but at the next anneal they resume random orientation.

✦ ✦ ✦

IN an aggregate of crystals of random orientation there are a lot of reactions bucking each other, while with preferred orientation they would get in line. The contrast might be likened to that between a panic-stricken mob trying to get through a narrow doorway, and a disciplined body of troops under competent leadership. It is known that if a metal is induced, by laboratory tricks, to solidify into enormous crystals (3 to 4 inches has been achieved) any such crystal, separately manipulated, will yield to deforming stresses by movement along its slip planes, at incredibly low stress values. Some years ago, in an article attempting to forecast the future of wire drawing, I mentioned the phenomenon, and postulated, as a remote possibility, a wire rod consisting of a single crystal.

✦ ✦ ✦

MR. Stringfellow has already set forth in these columns a theory which postulates the rotation of grains under back pull, to a more favorable orientation. Such an effect would operate chiefly in first drafts, and it is noteworthy that the two calculations in which the power saving nearly equalled or exceeded the possible saving were first drafts.

✦ ✦ ✦

THERE is also room for speculation as to coefficient of friction. We know it to be .08 to .10 in dry drawing, at unit pressures of 100,000 psi and upward. We know also that in ordinary bearing practice, at unit pressures usually below 5000 a coefficient of the order of .002 is reasonable. It is possible, even if unlikely, that at some such reduction in pressure as is possible in back-stressing, coefficient of friction may be thrown into another range, and affect total friction profoundly.

✦ ✦ ✦

STILL a third explanation is within the bounds of possibility. The tensile strength and yield point of steel rise slowly with temperature to about 700°F., fall ratner more rapidly to normal, and then fall off rapidly. It is probable that the heating of wire in the die increases the power required to draw it. Wire drawn reactively appears to heat less than in con-

(*Please turn to Page 281*)

TABLE I

		Total Friction	Possible to save	Actually saved
Swedish steel	.080-.072	207 lb.	64 lb.	50 lbs.
" "	.069-.060	160 lb.	54 lb.	17 lbs.
Soft basic	.080-.072	103 lb.	40 lb.	65 lbs.

Versatile

REDUCES COST

1. An intricate, modern Eyelet Machine(front view), Firthaloy equipped, manufactured by the Waterbury-Farrel Foundry & Machine Co., Waterbury, Conn.
2. Firthaloy equipped HI-PRO Header (view from the cut-off side), another Waterbury Farrel Foundry & Machine Co. product.
3. This segment type Universal Spring Coiler uses Firthaloy Dies. Courtesy of Sleeper & Hartley, Inc., Worcester, Mass.
4. A Firthaloy equipped nail heading department. Courtesy of Northwestern Steel & Wire Company, Sterling, Ill.

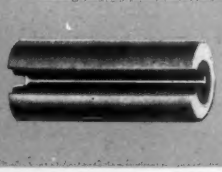
FIRTHALOY

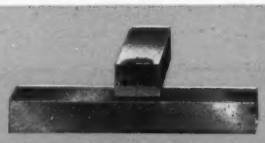
IN HUNDREDS OF APPLICATIONS

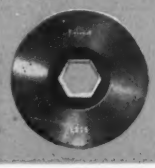
The highest tribute that can be paid to Firthaloy is the recognition shown by manufacturers who have adopted it as "standard" in their own product, or who recommend its use in conjunction with their equipment. And the list of manufacturers who have adopted Firthaloy dies and wear resistant parts, grows larger daily.

Firthaloy Dies have no peer for operations where long, uninterrupted runs, accuracy to size, better finish, and lower tool costs are desirable. Accuracies heretofore impossible have resulted from its use ... production measured in miles or tons or days, instead of in feet or pounds or hours, have been common.

Firthaloy Engineers are skilled and ingenious in adapting Firthaloy to difficult drawing, heading, forming, and shaping applications. You will be under no obligation if you ask them to co-operate in improving *your* die performance.







FIRTH-STERLING STEEL COMPANY

OFFICE AND WORKS:
McKEESPORT, PA.
BRANCH WAREHOUSES:
NEW YORK CHICAGO
HARTFORD PHILADELPHIA
LOS ANGELES DAYTON
CLEVELAND DETROIT

Economic Trends Favorable to Revival of Bessemer Process of Steel Making

ECONOMIC trends of today contain elements that are favorable to a revival in the Bessemer process of making steel, H. W. Graham, Director of Metallurgy and Research of the Jones & Laughlin Steel Corporation, told a group of engineers and metallurgists when speaking before a joint meeting of the Pittsburgh Section of the American Institute of Mining & Metallurgical Engineers, the A. I. M. M. E. National Bessemer Committee, and the Steel Works Section of the Engineers Society of Western Pennsylvania recently.

✦ ✦ ✦

IT was believed by many of those who heard the talk that Mr. Graham's paper would form the basis for the metallurgical work of the next decade toward development and improvement of the Bessemer process to restore it to its proper place in the economics of the steel industry. Mr. Graham pointed out, that granted the necessary assistance by management and operating staff, the only factor limiting the extent of such a revival is the rapidity and completeness with which the metallurgist can solve such quality problems as are involved.

✦ ✦ ✦

"WITH our present high level of technical knowledge, with improved instrumentation available, and with an economic urge to do the job," he said, "we should make rapid progress."

✦ ✦ ✦

AFTER reviewing the figures which show a steady movement to open-hearth production at the expense of Bessemer operation, Mr. Graham said that few realize the extent of the domination of the steel scrap market upon the relationship of Bessemer and open-hearth tonnages, particularly upon the probable future of the Bessemer process. The ready availability of scrap obviously favored the open-hearth process in the past, but he said that present economic conditions should justify earnest attention to an increased use of the Bessemer converter as at least a partial protection against a decreasing availability of scrap.

✦ ✦ ✦

THROUGHOUT its history, Bessemer steel, Mr. Graham stated, has had certain inherent qualities which make it preferable to open-hearth steel for certain specific applications.

✦ ✦ ✦

"IF the Bessemer process were given even a portion of the lavish technical aid provided for the open-hearth process, it might retain its proportionate place, retaining its undoubted inherent advantages," Mr. Graham said. "The problem facing the Bessemer steel metallurgist today is not to remove the inherent qualities of Bessemer steel, but to identify them and derive controls therefore so that they can be reproducibly placed at will at any given desired value."

✦ ✦ ✦

H. W. GRAHAM
Director of Metallurgy and Research
Jones & Laughlin Steel Corp.
Pittsburgh, Pa.

MR. Graham discussed the many factors affecting control of the Bessemer process, and developed the fundamental considerations involved in the control of iron temperature and quality of air-blast volume and moisture content, and further dealt with the extent to which mechanical features affected such control.

✦ ✦ ✦

THE determination of the finishing time or "end point" of the blow is of great importance, Mr. Graham said, as at a given moment the charge begins to "commit suicide" by burning itself back into iron oxide. This change takes place with great rapidity which requires precise control of the "end point." In discussing a photo-cell arrangement which has produced a method with very helpful control features, he said. "The chart record obtained by this photometric system shows very characteristic shape features that precisely reflect the progress of reactions in the vessel itself — providing an evaluation of the time factor at the end of the blow."

✦ ✦ ✦

AS a result of many tests, Mr. Graham claimed that the end-point of the flame has a direct bearing on quality results, showing that the yield of good material was highest when the blow was stopped at the proper time and that by varying the time of the "after-blow" a matter of a few seconds, desired quality results can be predetermined at will. The efforts of his research and metallurgical staffs are now being directed to full exploration of the exact length of afterblow which is most favorable for each grade of product, he said.

(*Please turn to Page 284*)

Exports and Imports of Wire

Exports of Iron and Steel Wire Products in Feb. 1940 and Feb. 1939
(In Gross Tons)

	FEB. 1940	JAN. 1940	FEB. 1939
Wire rods	14,417	9,295	360
Strip Steel	13,559	18,271	8,056
Plain, black or galvanized iron or steel wire	10,567	9,746	3,822
Barbed wire and woven wire fencing	2,014	2,917	2,135
Woven wire screen cloth	296	182	143
Wire rope	705	809	379
Insulated iron or steel wire and cable—see analysis below			
Other wire and manufactures	1,981	1,226	450
Wire nails	4,275	5,358	1,176
Tacks	71	73	22
Other nails, including staples	239	329	252
Bolts, machine screws, nuts, rivets and washers	1,185	1,081	549
Total, these 11 classifications	49,309	49,287	17,344

Imports of Iron and Steel Wire Into the United States
(In Gross Tons)

Concrete Reinforcement bars	.....	.....	162
Hollow bar and drill steel	196	189	63
Wire rods	499	1,037	711
Barbed wire	.....	.....	1,654
Round iron and steel wire	120	200	282
Telephone and telegraph wire	.....	.....	.....
Flat wire and strip steel	237	230	166
Wire rope and strand	82	81	134
Other wire	.....	.....	251
Hoops and bands	52	305	1,670
Nails, tacks and staples	7	38	796
Bolts, nuts and rivets	19	5	6
Total, these 12 classifications	1,212	2,085	5,895

Exports of Insulated Wire and Cable, February 1940

	Foreign		To U. S. Possessions	
	Pounds	Dollars	Pounds	Dollars
Rubber-covered wire	1,196,059	$328,873	63,615	$ 17,718
Weatherproof wire	140,620	29,091	43,391	6,545
Other insulated copper wire	1,508,515	371,715	113,310	21,213
Nickel-chrome electric resistance wire	69,422	97,123	10	8
Total, these 4 classifications	2,914,616	$826,802	220,326	$ 45,484

Iron and Steel Exports Register Sharp Gain; Further Decline Recorded in Imports

AT 436,585 gross tons valued at $33,361,201 February exports of iron and steel products (excluding scrap) exceeded the high trade of January—396,064 tons valued at $31,153,365—by 40,521 tons and $2,207,836. In February 1939 only 134,777 tons of these goods valued at $9,772,707 were exported — about one-third by both quantity and value of the February 1940 trade.

✦ ✦ ✦

INCREASED shipments to the United Kingdom, Sweden and Belgium are largely responsible for the sharp gain in the trade with Europe with shipments totaling 146,447 tons against 109,957 tons in January. A less spectacular gain was registered in the trade with South America with shipments aggregating 119,639 tons against 110,657 tons in the preceding month. Exports to the Far East were virtually unchanged at 83,260 tons against 83,056 tons in January — the trade with Africa presenting a generally similar picture with February shipments at 14,577 tons in comparison with the January trade of 14,879 tons. The trade with North and Central America and the West Indies, however, was down—to a total of 72,662 tons against 77,515 tons in January.

✦ ✦ ✦

Imports Register Further Decline

IMPORTS of iron and steel products (scrap excepted) into the United States registered a further decline in February when but 6,467 tons of these commodities valued at $666,272 entered the country. January imports totaled 7,832 tons valued at $918,626 and those of February 1939, 17,736 tons valued at $1,236,673. Over the elapsed two months of 1940 this trade—amounting to but 14,299 tons valued at $1,584,898—was only 34 percent as great in quantity and 53 percent in value as that of the comparable period of 1939—42,067 tons valued at $2,965,818.

✦ ✦ ✦

Scrap Trade Higher

EXPORTS of iron and steel scrap from the United States in February totaled 234,716 tons valued at $4,137,635. These figures represent sharp gains over the 187,457-ton, $3,567,221 trade of January and also top the 224,913-ton, $3,345,344 trade of February 1939. Cumulative shipments covering the first two months of the year — 422,173 tons — are well under the 452,792-ton total registered in the comparable period of 1939. By value, however, the 1940 shipments exceed those of 1939 by a considerable margin—$7,704,856 against $6,696,695.

✦ ✦ ✦

United Kingdom Again Leading Purchaser

BY virtue of the large purchases of non-alloy steel ingots, blooms, etc., (54,321 tons) and pig iron (11,789 tons) the United Kingdom ranked first among the United States' export markets for iron and steel in February—the total of 68,130 tons representing a sharp gain over the 45,675 tons taken by this market in January. Argentina ranked second with a trade of 43,281 tons (37,735 tons in January) including 7,310 tons of non-alloy "black" steel sheets, 6,538 tons of concrete reinforcement bars, 4,105 tons of wire rods, 3,438 tons of non-alloy "other" steel bars, and 3,174 tons of non-alloy "other" plate. Canada, in third place, took non-alloy "other" plate, 8,364 tons; non-alloy "black" steel sheets, 7,605 tons; non-alloy hot-rolled strip steel, 4,134 tons; plain shapes, 3,618 tons; and skelp, 339 tons as the most important items in the 40,586 ton trade (43,966 tons in January).

Scrap Trade Registers Gain

FEBRUARY scrap exports rose to 234,716 gross tons from the 187,457-ton trade of January. The most important markets were Japan, 101,619 tons; the United Kingdom, 56,162 tons; and Italy 49,636 tons. Included in the 234,716-ton trade is 232,800 tons of iron and steel scrap, 419 tons of tin plate scrap, 314 tons of terneplate clippings, etc., 454 tons of tin plate circles, and 729 tons of waste-waste tin plate.

✦ ✦ ✦

Further Decline in Imports

THE principal item in the February import trade of 6,467 tons was pig iron—2,032 tons—furnished by British India, 1,782 tons and Canada, 250 tons. Ferromanganese was second with 1,595 tons which was furnished entirely by Norway. Receipts of no other commodity exceeded 500 tons during the month.

✦ ✦ ✦

British India Chief Source Of Supply

THE 1,782 tons of pig iron had from British India was enough to make that country the chief source of iron and steel imports in February. Norway—on the basis of 1,595 tons of ferromanganese and 100 tons of "other" ferroalloys—was the second largest supplier, while Sweden ranked third with a total of 1,531 tons including, as principal items, 499 tons of wire rods and 194 tons of hollow bar and drill steel.

✦ ✦ ✦

CARD Clothing: 16,277 square feet and $24,298 (16,482 square feet, $30,354). The United Kingdom sent 14,682 square feet at $21,103 and Belgium sent the remainder—1,595 square feet at $3,195.

✦ ✦ ✦

WIRE Cloth and Screening: 22,365 square feet (45,239 square feet). Of this total 15,646 square feet came from the Netherlands, 3,981 square feet from France, and 2,738 square feet from Canada.

WIRE Fencing and Netting: Galvanized before weaving: None (75,000 square feet). **Galvanized after weaving:** 5,500 square feet (none) entirely from the United Kingdom.

✦ ✦ ✦

FOURDRINIER: 11,376 square feet (6,267 square feet). Sweden was the source of 7,807 square feet and France the source of 3,569 square feet.

✦ ✦ ✦

WIRE Heddles: 155,000 pieces (none). Belgium furnished the entire amount.

✦ ✦ ✦

Wood Screws

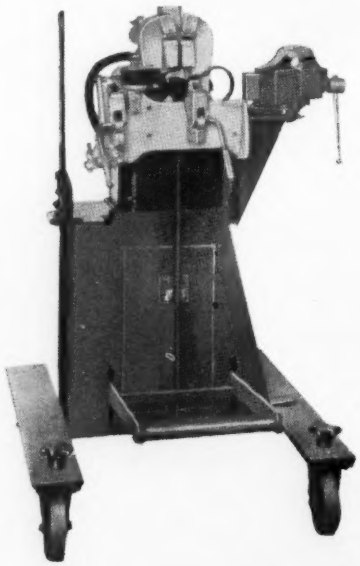
EXPORTS of iron and steel wood screws during February 1940 totaled 38,343 gross valued at $6,245. Of this total, Colombia took 19,464 gross valued at $3,044; Venezuela, 5,149 gross valued at $776; Netherlands, 3,577 gross valued at $511; Mexico, 2,003 gross valued at $270; Chile, 1,064 gross valued at $117; Canada, 1,024 gross valued at 155; Costa Rica,

MICROMETER PRECISION MICRO-WELD TRADE MARK REG. U. S. PAT. OFF.

CONTINUOUS IMPROVEMENT

MICRO-WELDERS with dial indicating annealing attachments are now available for high carbon wire.

There is positive control of annealing temperature and already hundreds of these special MICRO-WELDERS are proving their dependability and satisfactory performance with leading manufacturers.



MICRO PRODUCTS COMPANY
20 NORTH WACKER DRIVE, CHICAGO, ILL.
Telephone, State 7468

958 gross valued at $161; Peru, 725 gross valued at $131; Haiti, 587 gross valued at $91; Saudi Arabia, 489 gross valued at $139; Ecuador, 460 gross valued at $139; Guatemala, 435 gross valued at $108.

✦ ✦ ✦

EXPORTS of brass wood screws during the same month totaled 5,110 gross valued at $2,617. Of this total Argentina took 1,284 gross valued at $647; Panama Canal Zone, 1,263 gross valued at $661; China, 294 gross valued at $66; Jeru, 268 gross valued at $172; Neth. W. Indies, 252 gross valued at $171; Chile, 240 gross valued at $51; Venezuela, 232 gross valued at $106; Colombia, 171 gross valued at $122; Mexico, 165 gross valued at $120.

✦ ✦ ✦

IMPORTS of wood screws during the same month totaled 80 gross valued at $90, supplied by Belgium, 66 gross valued at $33, and Canada, 14 gross valued at $57.

✦ ✦ ✦

The Worcester Regional Meeting

(*Continued from Page 252*)

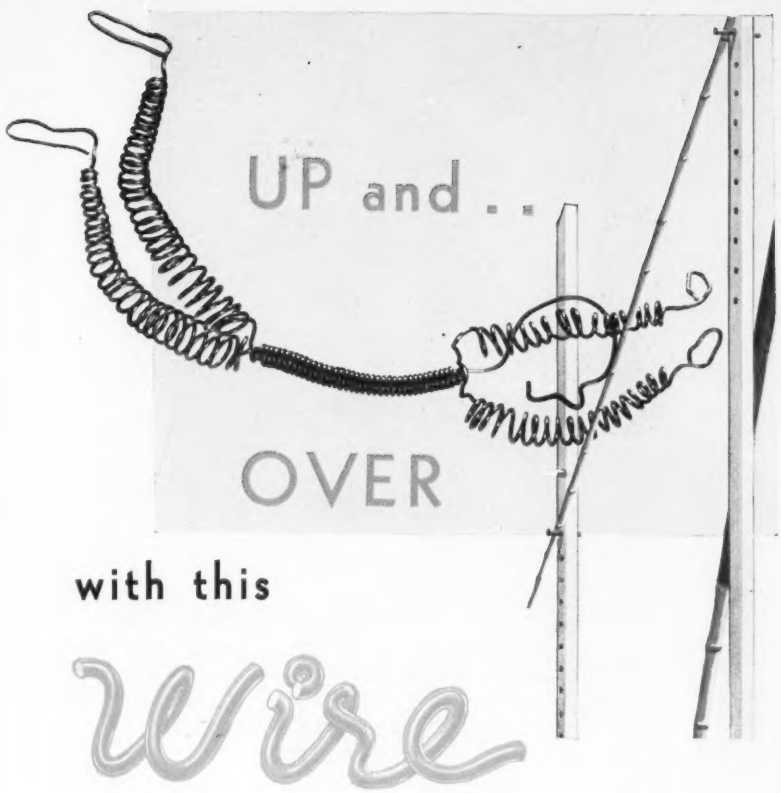
analysing the various applications of different grades, and the place each held in the industry. Mr. Longwell's paper is published in full in this issue of Wire & Wire Products. Open discussion followed the lecture, and the meeting wound up with the presentation of a floor show and entertainment.

✦ ✦ ✦

Attendance List — Worcester Regional Meeting The Wire Association

ANDERSON, HAROLD S., Engineer, Thomson-Judd Wire Machy. Co., Lynn, Mass.
ANJESKEY, A. J., Sales Manager, Cleveland Tramrail Division, Cleveland Crane & Engr'g. Co., Wickliffe, Ohio.
AUREN, A. G., Wickwire Spencer Steel Co., Worcester, Mass.
BACKSTROM, CARL W., Foreman, Worcester Wire Works, Worcester, Mass.
BARNES, GORDON C., Salesman, Geo. W. Prentiss & Company, Holyoke, Mass.
BEAMAN, P. A., Dept. Manager, Morgan Construction Co., Worcester, Mass.
BEARDSLEE, K. R., Gen. Sales Mgr., Carboloy Company, Inc., Detroit, Michigan.
BEESON, J. K., Asst. Gen. Mgr. Sales, Pittsburgh Steel Company, Pittsburgh, Penna.

(Please turn to Page 268)



with this

wire

If you have some fabrication problems to vault, give Keystone wire a try. In many plants this wire has boosted production up smoothly — and over schedules nicely. That's because Keystone technicians *know* how to deliver the performance you pay for. And they know how to keep that performance UNIFORM in every shipment. Possibly Keystone wire can give you a new "high" in satisfaction — either from stock or made to meet your own specifications.

Write

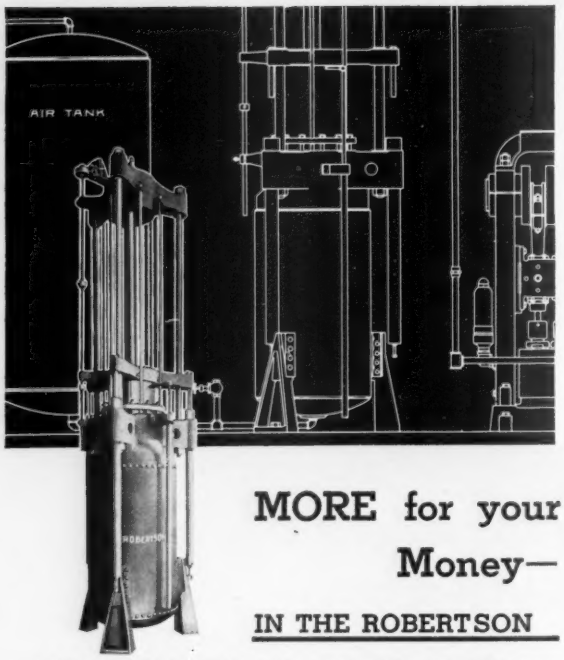
KEYSTONE

STEEL & WIRE CO., Dept. W. PEORIA, ILLINOIS

HIGH CARBON
or
LOW CARBON

SAMSON SPRING WIRE
REG. U.S. PAT. OFF.
KEYSTONE STEEL & WIRE CO. PEORIA, ILL.

Bright . . . Tinned
Coppered
Annealed
Galvanized



MORE for your Money—

IN THE ROBERTSON

HYDRO-PNEUMATIC ACCUMULATOR

This Accumulator is far easier than most to install and requires much less space. It utilizes its air tank as a base and requires no special, heavy foundation.

It is equipped with an automatic auxiliary air compressor which maintains pressure in cylinder and storage tanks.

It is SAFE—operates on only 175 lbs. air pressure. It is ECONOMICAL—requires little or no maintenance to produce perfect performance.

We invite your most critical appraisal of this Accumulator; write us for complete information. There's no obligation.

JOHN ROBERTSON COMPANY, INC.

125-137 Water Street, Brooklyn, New York.

Pioneers since 1858

When considering the installation of New Hydraulic Equipment—remember—

"Leaders Choose Robertson!"

Attendance List—Worcester Regional Meeting of The Wire Association

(Continued from Page 267)

BLACKWELL, G. M., Supt.,
Worcester Wire Works,
Worcester, Mass.

BLOUNT, WM. H., President,
Sleeper & Hartley, Inc.,
Worcester, Mass.

BRALEY, S. A., Ch. Met. Field Engr.,
Pittsburgh Steel Company,
Pittsburgh, Penna.

BROWN, EVERETT, Wire Supt.,
American Optical Company,
Southbridge, Mass.

BROWN, HIRAM R., Foreman,
Hy-Carbo Steel Co.,
Lowell, Mass.

BROWN, RICHARD E., Publisher,
WIRE & WIRE PRODUCTS,
Stamford, Conn.

BROWNE, L. E., Associate Editor,
"STEEL",
New York, New York.

BUCHANAN, D. D., Mgr. of Oprs.,
Union Drawn Steel Div.,
Republic Steel Corporation,
Massillon, Ohio.

BUFFUM, S. P., Sales Rep.,
Jones & Laughlin Steel Corp.,
Boston, Mass.

BURNETT, C. D., Office Mgr.,
Union Drawn Steel Div.,
Republic Steel Corp.,
Hartford, Conn.

CARY, C. ARNOLD, Office,
Bethlehem Steel Co.,
Bethlehem, Penna.

CASEY, AUSTIN B., Sales Engr.,
Syncro Machine Company,
New York, N. Y.

CHERRY, GEORGE W., Supt.,
Cook, Dunbar & Smith Co.,
Providence, Rhode Island.

CLARIN, DAVID X., No. East. Dist. Mgr.,
Oakite Products Co.,
New York, New York.

CODDING, J. W., Asst. Mgr. of Sales,
Bethlehem Steel Company,
Boston, Mass.

COOCH, L. S., Metallurgist,
Buffalo Bolt Company,
N. Tonawanda, N. Y.

CORBIN, A. B., Sales Mgr.,
Firth-Sterling Steel Co.,
McKeesport, Penna.

COTTRILL, M. R., Exec. Asst.,
The Whitney Blake Company,
New Haven, Conn.

CUNNINGHAM, G. B., Pur. Agt.,
G. F. Wright Steel & Wire Co.,
Worcester, Mass.

DIXON, DOUGLAS T., Cost. Accg.,
Geo. W. Prentiss & Co.,
Holyoke, Mass.

EARLY, EDWARD F., Supt.,
Wickwire Spencer Steel Co.,
Worcester, Mass.

EKSTROM, SIGFRIED L., Asst. Gen. Mgr.,
New England High Carbon Wire Co.,
Millbury, Mass.

ELIAS, H. W., Asst. Mgr.,
Firth-Sterling Steel Co.,
New York, N. Y.

ENGLERT, M. G. K., Salesman,
Jones & Laughlin Steel Corp.,
Boston, Mass.

FISHER, E. J. P., Met.,
North Jackson, Ohio.

FORSBERG, GEORGE W., Pur. Agt.,
Johnson Steel & Wire Co.,
Worcester, Mass.

GARRETT, C. W., Ch. Insp.,
Jones & Laughlin Steel Corp.,
Detroit, Michigan.

GEDDES, J. W., Engineer,
H. K. Porter, Inc.,
Everett, Mass.

GIBSON, W. A.,
Reed & Prince Mfg. Co.,
Worcester, Mass.

GRANGER, L. D., Asst. to V. P.,
Wickwire Spencer Steel Co.,
New York, N. Y.

HAKA, JOHN E., Works Mgr.,
Midland Wire Corporation,
Tiffin, Ohio.

HAMAKER, R. L., Dist. Sales Mgr.,
Warner Company,
New York, N. Y.

HARDY, C. D., Met.,
Thompson Wire Co.,
Worcester, Mass.

HARDY, C. K., Supt.,
Thompson Wire Co.,
Worcester, Mass.

HARRIS, FRANCIS A., President,
F. A. Harris, Inc.,
Springfield, Mass.

HART, HOWARD P., Secy.,
Platt Bros. & Company,
Waterbury, Conn.

HART, J. L., Mech. Sales,
B. F. Goodrich Company,
Boston, Mass.

HARTLEY, GEO. D., Consultant,
Worcester, Mass.

HARTWELL, R. L., Asst. to Pres.,
Metal Textile Corp.,
Orange, N. J.

HARVEY, L. W., Supt.,
Platt Bros. & Company,
Waterbury, Conn.

HEYN, H. M., Sales Manager,
Surface Combustion Co.,
Toledo, Ohio.

HOSMER, PAUL B., Salesman,
White & Hodges,
Everett, Mass.

HUME, W. G., Gen. Mgr. of Sales,
Pittsburgh Steel Co.,
Pittsburgh, Penna.

HUNTER, R. W., Foreman,
Geo. W. Prentiss & Co.,
Holyoke, Mass.

HUNTRESS, HOWARD B., Ch. Tester,
Wickwire Spencer Steel Co.,
Palmer, Mass.

HUSSEY, R. M., Supt. Wire Dept.,
Jones & Laughlin Steel Corp.,
Aliquippa, Penna.

IRWIN, G. A., Major,
Signal Corps., U. S. Army,
Brooklyn, New York.

JAGIELSKI, OTTO F., Mech. Engr.,
Heald Machine Company,
Worcester, Mass.

JOHNSON, C. E., Supt.,
Bethlehem Steel Co.,
Sparrows Point, Md.

JOHNSON, C. L., Asst. Foreman,
Worcester Wire Works,
Worcester, Mass.

JOHNSON, HENRY G., Sales Manager,
Oakite Products Co.,
Worcester, Mass.

JOHNSON, WILLARD J., Sales Dept.,
National Rubber Machy. Co.,
Clifton, N. J.

KIESS, CLYDE G., Sales Engr.,
National Rubber Machy. Co.,
Akron, Ohio.

KELLER, JULES, Vice President,
Broden Construction Co.,
Cleveland, Ohio.

KITTREDGE, F. B., Dist. Sales Mgr.,
Jones & Laughlin Steel Corp.,
Boston, Mass.

KOVALESKI, VICTOR, Dieman,
Carboloy Company, Inc.,
Worcester, Mass.

LACUS, AUGUST, Foreman,
Geo. W. Prentiss & Company,
Holyoke, Mass.

LAFORCE, ALPHONSE, Foreman,
Geo. W. Prentiss & Co.,
Holyoke, Mass.

LEWIS, KENNETH B.,
Consulting Wire Mill Engr.,
Worcester, Mass.

LINDSTROM, F. G., Asst. Supt.,
Wickwire Spencer Steel Co.,
Worcester, Mass.

LONGWELL, JAMES R., Ch. Engr.,
Carboloy Company, Inc.,
Detroit, Michigan.

LOUGHRY, T. D., Dist. Sales Mgr.,
Surface Combustion Co.,
Toledo, Ohio.

LOWELL, ROBERT S., Foreman,
Geo. W. Prentiss & Co.,
Holyoke, Mass.

LUNDQUIST, A. P.,
Thompson Wire Co.,
Worcester, Mass.

LUNDQUIST, C. R.,
Thompson Wire Co.,
Worcester, Mass.

MAC DUFF, H. G., Sales Rep.,
Carboloy Company, Inc.,
Worcester, Mass.

MAC LAFFERTY, T. D., Dist. Mgr.,
Carboloy Co., Inc.,
Worcester, Mass.

MALMSTROM, UNO, Ch. Engr.,
John A. Roebling's Sons Co.,
Trenton, N. J.

MANION, R. V., Sales Rep.,
Fiske Bros. Refining Co.,
Newark, N. J.

MELVILLE, NORMAN F., Mgr. Wire Sales,
Pittsburgh Steel Company,
Pittsburgh, Penna.

MOONEY, R. F.,
Worcester Wire Works,
Worcester, Mass.

(Please turn to Page 270)

WIRE

To consider your special needs and problems in wire, all the skill and experience of our metallurgists are at your command. Perhaps—as has happened with many manufacturers—they can point the way to faster work, fewer rejections, lower costs, and a better, more dependable product. As specialists in low-carbon wire we often can furnish a combination of analysis and temper that simplifies fabrication and improves strength in the final product.

Besides special-analysis and copper-bearing steel wire Continental — and only Continental—offers wire of Konik, the patented new steel containing copper, nickel, and chromium. Konik's amazing amenability to carburizing and heat-treatment permits new peaks of hardness, toughness, and resistance to abrasion. Its economies have been proved in four years of use by a variety of manufacturers.

Among the finishes offered by Continental are bright, bright and black annealed; sull-coated; processed; galvanized, including Flame-Sealed; liquored, coppered and tinned in many modifications. Eight shapes are standard, and many specials available. Regular gauges run from No. 34 to 5/8 inch. Furnished in coils of suitable sizes, or cut and straightened to specification.

CONTINENTAL STEEL CORPORATION

General Offices: Kokomo, Indiana • Plants at Canton, Kokomo, Indianapolis

CONTINENTAL

STEEL SHEETS AND WIRE PRODUCTS

Wire: Bright Basic, Annealed, *Konik, Special Manufacturers, Galvanized, *Flame-Sealed

Wire Rods, Nails, Staples, Bale Ties, Barbed Wire, Fence 15 Types: Gates and Fittings

Sheets: Black, Galvanized, Special Coated: Roofing and Siding 14 Styles

*Trade Mark Registered, U. S. Patent Office

Attendance List — Worcester Regional Meeting The Wire Association

(Continued from Page 269)

MORGAN, WELD, Engr.,
Morgan Construction Co.,
Worcester, Mass.

MORRIS, THOMAS E., Rep.,
Fiske Bros. Refining Co.,
Newark, N. J.

MOYER, R. F., Vice Pres.,
Standard Machinery Co.,
Providence, Rhode Island.

MUGFORD, C. A., Salesman,
National Oil Products Co.,
Harrison, N. J.

MYERS, HAROLD A., Exec.,
Terkelsen Machine Company,
Boston, Mass.

NEWMAN, R. K., Manager,
Union Drawn Steel Div.,
Republic Steel Corp.,
Hartford, Conn.

NICHOLS, J. R., Rep.,
Pittsburgh Steel Co.,
Pittsburgh, Penna.

O'DAY, THOMAS W., Supt.,
Hy-Carbo Steel Co.,
Lowell, Mass.

OGDEN, J., Met.,
I. Stern & Company, Inc.,
New York, N. Y.

PAHARIK, BENNIE, Service Mgr.,
Carboloy Company, Inc.,
Worcester, Mass.

PARTON, G. C., Field Engr.,
Morrison Engr. Corp.,
Cleveland, Ohio.

PATNAUDE, FRANK, Salesman,
Standard Machinery Company,
Providence, Rhode Island.

PATTERSON, MEADE W., Asst. Wks. Mgr.,
Bridgeport Brass Company,
Bridgeport, Conn.

PETIX, JOSEPH M., Sales Engr.,
J. O. Ross Engr. Co.,
New York, N. Y.

PETERSON, R. C., Pur. Agt.,
Thompson Wire Co.,
Worcester, Mass.

PETTERSON, ARTHUR R., Vice Pres.,
Thomson-Judd Wire Machy. Co.,
Lynn, Mass.

PHANEUF, ERNEST C., Pur. Agt.,
Worcester Wire Works,
Worcester, Mass.

PYNE, J. S., Mech. Sales,
B. F. Goodrich Company,
Boston, Mass.

RABITOV, IRA A., Salesman,
Firth-Sterling Steel Co.,
Hartford, Conn.

RANDOLPH, BREWSTER R., Met.,
Reed & Prince Mfg. Co.,
Worcester, Mass.

RICH, CLIFTON A., Foreman,
G. F. Wright Steel & Wire Co.,
Worcester, Mass.

ROEMER, H. A., JR., Mgr. Sales Rod & Wire,
Pittsburgh Steel Company,
Pittsburgh, Penna.

ROTH, EUGENE, Sales Engr.,
Carboloy Company, Inc.,
Worcester, Mass.

RYAN, GEORGE, Foreman,
Geo. W. Prentiss & Co.,
Holyoke, Mass.

RYAN, L. A., Asst. to Pres.,
Fiske Bros. Refining Co.,
Newark, N. J.

SANDSTROM, C. C., Sales Engr.,
Vascoloy-Ramet Corp.,
North Chicago, Ill.

SEYMOUR, L. D., Asst. Wks. Mgr.,
Canada Works, Steel Co. of Canada, Ltd.,
Hamilton, Ontario, Canada.

SHORT, C. P., Salesman,
Steel Co. of Canada, Ltd.,
Hamilton, Ontario, Canada.

SMITH, O. T., Dist. Mgr.,
Firth-Sterling Steel Co.,
Hartford, Conn.

SNOWDEN, H. N., Supt.,
John Roebling's Sons Co.,
Trenton, N. J.

SOHLMAN, E., Supt.,
Sleeper & Hartley, Inc.,
Worcester, Mass.

SOLGER, W. H., Sales Engr.,
Aetna-Standard Engr. Co.,
Youngstown, Ohio.

SOLOMON, BARNEY, Asst. Mgr.,
Worcester Wire Works,
Worcester, Mass.

SPAULDING, C. E., Asst. Treas.,
Sleeper & Hartley, Inc.,
Worcester, Mass.

SPOWERS, W. H., JR.,
Consulting Engineer,
New York, N. Y.

STEIR, G. G., Asst. Mgr. Sales Spec. Div.,
National Oil Products Co.,
Harrison, N. J.

STERN, H. JAMES, Vice Pres.,
I. Stern & Co., Inc.,
New York, N. Y.

STONE, J. L., Met.,
Union Drawn Steel Div.,
Republic Steel Corp.,
Hartford, Conn.

STRICKLEN, J. R., Vice Pres.,
National Rubber Machy. Co.,
Akron, Ohio.

STROMBERG, VINCENT, Met. Engr.,
John Bath & Company,
Worcester, Mass.

SWANSTROM, G. A., Supt.,
G. F. Wright Steel & Wire Co.,
Worcester, Mass.

SWINSKI, WALTER J., Foreman,
Geo. W. Prentiss & Co.,
Holyoke, Mass.

TATNALL, R. R., Met. Engr.,
Wickwire Spencer Steel Co.,
Worcester, Mass.

THOMAS, EARLE H., Supt.,
Geo. W. Prentiss & Co.,
Holyoke, Mass.

THOMPSON, B. P.,
Thompson Wire Co.,
Worcester, Mass.

UMLAUF, C. J., Plant Met.,
Union Drawn Steel Div.,
Republic Steel Corp.,
Hartford, Conn.

VAN HOOK, CHAS. F., Vice Pres.,
Watson Machine Company,
Paterson, N. J.

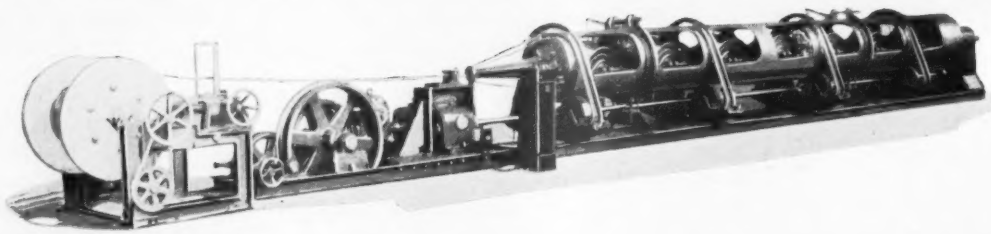
WATKINS, STANLEY P., Mgr. Sales Devl.,
Rustless Iron & Steel Corp.,
Baltimore, Maryland.

WEINMANN, E. R., Sales Mgr.,
Nukem Products Corp.,
New York, N. Y.

WELSH, J. ALAN, Sales Engr.,
Firth-Sterling Steel Company,
Hartford, Conn.

WERME, M. G., Supt.,
Wickwire Spencer Steel Co.,
Worcester, Mass.

Announcing the New 1940 Model National Tube Type Strander



THIS Strander is equipped with variable speed haul-off eliminating the use of change gears. With the new National Strander, changing lay lengths is but a matter of seconds.

✦ ✦ ✦

CHANGING from right lay to left lay requires only the shifting of clutch lever; electric brakes of latest type add much to the efficiency of operation.

✦ ✦ ✦

THIS Strander is equipped with ball-bearings throughout, has Textilite tube rollers and Carboloy wire guides, quick operating bobbin latches and bobbin brakes.

✦ ✦ ✦

Made for 9", 12", 16" and 22" standard bobbins.
Equipment for Wire and Rubber Industries.

NATIONAL RUBBER MACHINERY CO.

General Office: AKRON, OHIO

Banner Division, COLUMBIANA, OHIO
Eastern Division, CLIFTON, N. J.

David Bridge & Company, Ltd., Manchester, England
The Bawden Machine Company, Ltd., Toronto, Canada

WHITTEN, J. L., Sales Manager,
Lee Wilson Engr. Co.,
Cleveland, Ohio.
WILCOX, LELAND D., Plant Engr.,
Union Drawn Steel Div.,
Republic Steel Corp.,
Hartford, Conn.
WILEY, WM. G., Asst. to Gen. Sales Mgr.,
General Cable Corp.,
New York, N. Y.
WINKLER, L. H., Met. Engr.,
Bethlehem Steel Company,
Bethlehem, Penna.
ZEIGLER, ALFRED, Supt.,
High Carbon Wire Mill,
Wickwire Spencer Steel Co.,
Palmer, Mass.

MAJOR G. C. IRWIN
Signal Corps., U. S. Army
At Worcester Regional Meeting

The Broad Field of Use for Cemented Carbides

(*Continued from Page 251*)

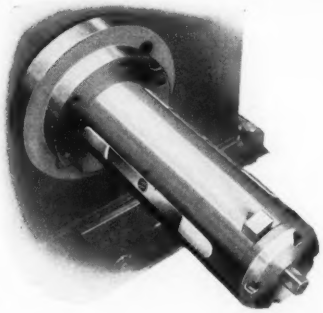
been tipped with carbides in order that the precision would not be lost through wear on all parts.

✦ ✦ ✦

ONLY last week we were called in by a large manufacturer who was having trouble holding the correct spacing between holes in a part which he machined in large quantities. We found that his drill jig bushings were wearing very rapidly. He was using a standard drill jig bushing costing $1.14 but which lasted only 3 hours. By applying carbide bushing he saved considerable down time of the machine, and the bushings have been in use for several weeks, so that they have more than paid for themselves, although they cost $55.00 apiece when applied.

WE have covered the three principal fields of application of carbide, namely the wire drawing die, the cutting tool and the wear resistant part. We believe with this general picture, you will have a greater appreciation of the part played by carbides in industry today, and in order to illustrate some of these various applications, we have a few slides which we would like to throw on the screen at this time.

Part III
Taping and Stranding
by
Otto F. Jagielski
Will Be Published
In the June Issue
of
Wire and Wire Products



Syncro E-x-p-a-n-d-i-n-g Arbors
bring you 8 important advantages

Designed to provide better reel mounting, Syncro expanding arbors for take-ups incorporate the following important advantages.

- They hold reels firmly, thus eliminating destructive vibration.
- They eliminate the need for close tolerances in reel bores.
- They centralize the reel in relation to the supporting arbor.
- Powerful expanding jaws hold reels firmly on high speed machines without the use of driving pins.
- They increase reel life by eliminating wear between arbor and reel bore during spooling.
- Reel changes are made in record time because normally, one turn of the handle is sufficient to loosen a reel.
- A unique, quick acting safety lock, operated by friction and positively held in locked position by centrifugal force, prevents the reel from leaving the arbor under any conditions during operation.
- They greatly reduce noise.

It will pay you to equip your present take-ups with Syncro Expanding Arbors and to definitely specify them for every new take-up you order.

Write for details and prices.

Syncro Machine Company
420 Lexington Avenue, New York — McCormick Bldg., Chicago
Represented in Canada by — Canadian Elevator Equipment Co., Ltd., Toronto

A Review of Recent Wire Patents

Patent 2,192,260, WIRE COILING MACHINE, Patented March 5, 1940 by Clayton F. Fisher, Spencer, and Edward E. Franks, Jr., Worcester, Mass., assignors to Sleeper & Hartley, Inc., Worcester, Mass., a corporation of Mass.

An object of the invention is to provide a machine to manufacture wire coils of desired pitch and number of turns as well as to sever the wire after a predetermined number of spaced coils have been formed. There are 27 claims.

Complete Descriptions and Drawings of Patents May Be Had for 25 cents. Address, Wire & Wire Products, 300 Main St., Stamford, Conn.

Patent 2,192,618, COIL WINDING MACHINE, Patented March 5, 1940 by Joseph Edward Papin, St. Louis, and Homer H. Black, Overland, Mo., assignors to Wagner Electric Corporation, St. Louis, Mo., a corporation of Delaware.

MAKES ROD BAKING PART OF CLEANING OPERATION
Canadian plant handles up to 18 tons per hour through a tank-sized Morrison Flash Baker in the cleaning line
WORLD WIDE USE MEANS A WORLD OF EXPERIENCE
BEHIND MORRISON ROD BAKERS
DATA
Type: Flash Baker
Size: One unit
Work: Low carbon rod and wire
Time: 4 to 6 minutes average
Tons: 12 to 18 per hour
Fuel: Oil - direct fired
U. S. Patents
1,999,513 2,156,303
MORRISON ENGINEERED
405
One Morrison Flash Baker unit, which completes its cycle in four to six minutes, is turning out as much as 18 tons of perfectly baked rod per hour for a large Canadian mill. Moreover, great space is saved by the tank-sized baker located right in the cleaning line where its work merely becomes part of the continuous cleaning process. With this great convenience, plus saving of much time and space, goes considerable improvement in drawing quality and uniformity of the rod . . . The same experience that produced these results is behind all Morrison installations -- behind yours if it is made by Morrison.
MORRISON
ENGINEERING CORP.
5005 Euclid Ave. - Cleveland, Ohio

This machine may be adapted to wind various numbers of wire coils, as well as to vary the size of coils, both as to length and number of turns.

✦ ✦ ✦

Patent 2,192,832, METHOD OF MANUFACTURING COVERED WIRES, Patented March 5, 1940 by Hidejiro Ito, Yokahoma-Shi, and Takeshi Masuda, Tokyo-Shi, Japan.

The method comprises splitting up and loosening a crushed and broken vegetable fibre (cotton, hemp, flax and the like), then intermingling the fibre in a liquid to form a suspension, and passing the wire through the suspension while revolving the wire relatively to the liquid whereby the suspended fibre is wound quickly and uniformly around the wire.

✦ ✦ ✦

Patent 2,193,477, SCREW, Patented March 12, 1940 by William A. DeVellier, Newark, N. J.

A diamond-shaped recess is formed in the screw head, with standard acute angles at each end and obtuse angles in the middle between the side walls and truncated at each acute angle end.

✦ ✦ ✦

Patent 2,194,248, COIL WINDING MACHINE, Patented March 19, 1940 by William F. Saul, Barnsboro, N. J.

This assembly includes a core supporting member, this being movable along its longitudinal axis, means for rotating the movable member at a predetermined speed, a rotatable lead screw, a slidable member operated by the lead screw, and means including members carried by the slidable member for controlling the longitudinal axial movement of the rotatable member.

✦ ✦ ✦

Patent 2,194,565, DEVICE AND METHOD FOR CLEANING OR DRYING WIRE AND OTHER STRAND MATERIAL, Patented March 26, 1940 by John B. Moss, Providence, R. I., assignor to Kennecott Wire and Cable Company, Phillipsdale, R. I., a corporation of Rhode Island.

Air blasts are employed, traveling in a confined tubular stream laterally surrounding the moving wire and then diverting the stream to move in parallelism with the lengthwise movement of the wire and, finally, gradually diverging the stream to a free-dispersion area.

✦ ✦ ✦

Patent 2,194,941, METHOD OF PRODUCING INSULATED WIRES, Patented March 26, 1940 by Anthony P. Hinsky, Brooklyn, N. Y., assignor to Pyro Products Corporation, Brooklyn, N. Y., a corporation of New York.

The method comprises applying a heated colored fluid compound coating to an insulated conductor, allowing the coating to set while still remaining warm, then simultaneously applying and embedding fluid print markings in the coating longitudinally of the conductor while the coating is still warm, the markings contrasting in color to that of the coating and being embedded to substantially fill the imprint of the markings in the coating, and drying the markings by the heat of the warm coating.

Patent 2,195,043, WIRE TYING MACHINE, Patented March 26, 1940 by Parvin Wright, Seattle, Wash., assignor to The Stanley Works, New Britain, Conn., a corporation of Connecticut.

Specifically, this machine is said to be adapted to apply wire about a box or the like, and includes a wire feeder and tensioner, a wire twister, and a device for moving the box to the twister, this last device automatically inaugurating actuation of all of the other devices named.

✦ ✦ ✦

Patent 2,195,102, APPARATUS FOR TREATING STRANDS, Patented March 26, 1940 by Sigurd Thronsen, Stoneleigh, Md., assignor to Western Electric Company, Incorporated, New York, N. Y., a corporation of New York.

To provide a strand of angular cross section, the assembly includes a pair of co-acting forming rolls, each of the forming rolls having portions of different diameters to form a predetermined shape, the space between the rolls being slightly smaller than the cross-section of the material being worked upon, and the ends of the rolling surfaces having substantially radially extending spaces for the reception of excess material to form fins extending transversely of the plane of the strand, and means comprising a pair of shearing discs rotatable in the plane of the strand for receiving the strand therebetween to remove the fins.

✦ ✦ ✦

David E. Jackman Retires

FOLLOWING the annual meeting of Firth-Sterling Steel Company, L. Gerald Firth, president announced the retirement of

David E. Jackman, 78, treasurer of the company since 1911. H. R. Huemme, of McKeesport, formerly assistant treasurer was elected treasurer. Mr. Jackman continues as a director of the company.

✦ ✦ ✦

PRIOR to his association with Firth-Sterling, Mr. Jackman had been treasurer of Westinghouse Machine Company before it became a part of Westinghouse Electric. He also had held the office of treasurer of Pittsburgh and Montana Copper Company when it was absorbed by East Butte Copper Company.

✦ ✦ ✦

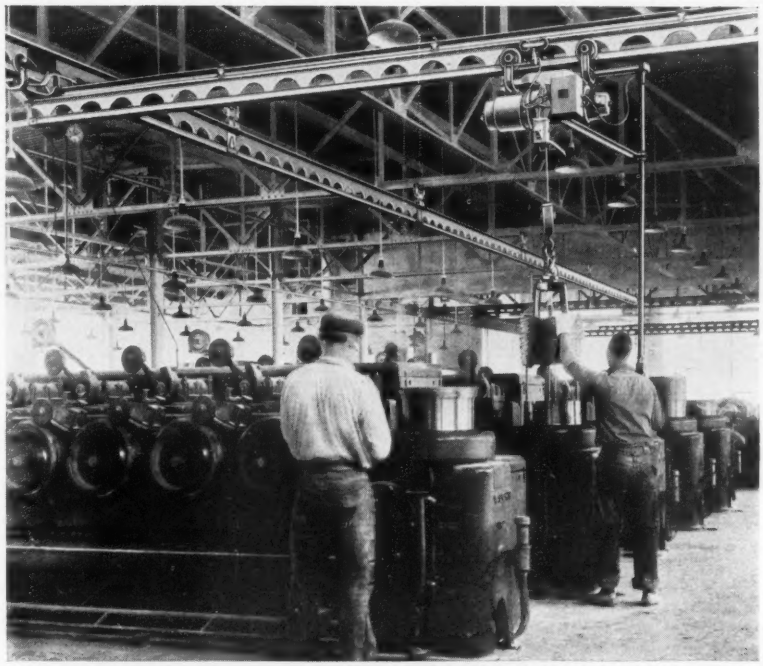
Industrial Ovens and Dryers

A NEW catalogue of Industrial Ovens and Dryers, profusely illustrated with examples of various types and containing complete information on methods of construction and application, has just been issued by The Gehnrich Corporation, Skillman Avenue and 35th Street, Long Island City, New York.

✦ ✦ ✦

COPIES of this catalogue may be obtained by addressing the Editor of WIRE & WIRE PRODUCTS.

Send In Your Reservation
for the
Pittsburgh Regional Meeting
Friday, May 17, 1940
The Wire Association
300 Main St. Stamford, Conn.



BLOCK STRIPPING CRANES and CARRIERS

For many years Cleveland Tramrail has been the leading supplier of block stripping cranes and carriers to the Wire Industry, for both internal and external stripping. Hundreds of such units are in operation.

Crane and carrier, illustrated, are easily propelled by hand by means of a rigid arm on lower end of which is a push-button station for convenient operation of hoist. If desired, hoist may be mounted on turn-table for ready service to blocks on two sides of aisle.

CLEVELAND TRAMRAIL DIVISION
THE CLEVELAND CRANE & ENGINEERING CO.
1141 Depot Street Wickliffe, Ohio

CLEVELAND TRAMRAIL
OVERHEAD MATERIALS HANDLING EQUIPMENT
Other products: CLEVELAND CRANES and STEELWELD MACHINERY

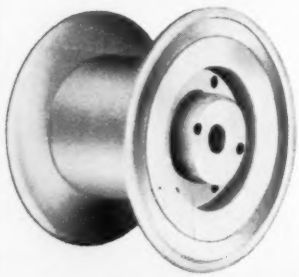
'Round the World With the Wire Industry

THE general demand for wire products has slightly declined on most export markets. Nevertheless prices are officially firmer. One reason is that the Belgian export cartel has revised prices to the level of actual business quotations. The official prices have been for some time below these figures. Wire nails are offered on the basis of 2250 Belgian francs per ton. The basis of payment for nails is often made in francs, but on all others quotations in dollars are prevailing. The bright wire basis is 60 to 62; galvanized, between 68 and 72; barbed wire, now as before, in the neighborhood of $80. Shipment dates are, as before, rather delayed, but orders are more regularly executed. The competition from other European works is, of course, small, while the Italian industry seems to be unable to offer really interesting quantities for export. The very severe winter weather has hampered the whole Balkan traffic and a certain shortage of raw material was noticeable there. Business is now resumed and is chiefly in German hands. The agreement between Russia and Germany which provides a mutual goods exchange of 400 million dollars annually on both sides includes wire and wire products. Although the exact amount is unknown, it is certain that it is above five million dollars worth of wire products; mainly, wire ropes, strand, special steel wire, plough wire, tacks, finer grades of wire nails, wire gauze and wire mesh. Orders to a certain extent have already been placed. The orders for wire machinery continue to come in regularly, mainly for multiple spindle machines (Wire Drawing). Plans are also prepared to ship a few new wire factories to Russia based on German designs, i.e., 100% from cellar to roof, including all machines, bolts and doors complete. Such factories for other productions are starting to sell to Russia. The German engineers say that the Russians hitherto had made the mistake of ordering machines, etc., which were not fitted to the production plants constructed by themselves and that very often machines, plants and production power units did not fit together.

✦ ✦ ✦

NO special wire machinery exhibition was held this year at the Leipzig Fair, but only at the Vienna Fair for the special attraction of the Balkan and Near East trade. No new models were shown but mainly improvements on existing machines, particularly in wire nail and barbed wire machinery. Export prices for the clearing

FINE WIRE HIGH SPEED WIRE DRAWING SPOOLS



James Day (Machinery) Ltd.,
Sentinel House,
Southampton Row,
London, W. C. I, England.

MOSSBERG **PRESSED STEEL** CORP.

Announces a complete line of HEAVY DUTY PRECISION SPOOLS and REELS especially designed for high speed wire drawing and annealing.

The degree of efficiency obtained by the HIGH SPEED WIRE DRAWING MACHINE is largely dependent upon the accuracy and durability of the take-up spool.

The use of our PRECISION SPOOLS will increase your machine efficiency and eliminate your spool difficulties.

Complete range of sizes.

MOSSBERG PRESSED STEEL CORP

18 West Street,
ATTLEBORO, MASSACHUSETTS, U. S. A.

COMBINATION
500 lb. CAPACITY WIRE DRAWING — ANNEALING — STRANDING — REEL.

countries have been left more or less unaltered, but advances have been made in other markets.

✦ ✦ ✦

Japanese Plant Expansion Planned

ACCORDING to a report of the semi-official Japan Iron Manufacturing Company, the nation's largest producer, work in progress at the Yawata Steel Plant includes an extension of the silicon-steel sheet works, the erection of a new electric furnace, and the erection of new units for the production of steel wire and wrought steel. At the firm's Wanishi plant progress is reported on the third phase of the current expansion program with attention centered on equipment designed to produce steel directly from iron ore. Three coke oven units are also being erected here along with a by-product plant.

✦ ✦ ✦

Use of Metric Thread to be Compulsory in Germany

AFTER October 1, 1940, bolts, screws, nuts, and in general turned, pressed, or stamped parts of all kinds provided with internal or external threads in sizes up to 10 mm inclusive, and intended for use in Germany, shall be made exclusively according to the German standards for metric coarse thread (DIN 13 and 14) or fine thread (DIN 243, and 517 to 521, inclusive). Exemptions will be granted, upon application supported by valid reasons, for parts made for repair purposes. Such exemptions will be granted only as a temporary measure.

✦ ✦ ✦

Plans for Manufacture of Woven-Wire

PLANS for the manufacture of woven-wire screen cloth in rolls in Peru by Sr. Manuel Cassado (Fabrica de Puertas y Tejido de Alambre), Malecon Rimac 288, Lima, are reported to be underway.

✦ ✦ ✦

Greece Authorizes Importation Of Wire

THE Greek Government has allocated 5,500,000 drachmas in unrestricted exchange (about $38,500 at the current rate of exchange) for the importation of wire from any country in order to fill immediate requirements. Permits will be issued by the Bank of Greece only to established manufacturers using wire as a raw material.

✦ ✦ ✦

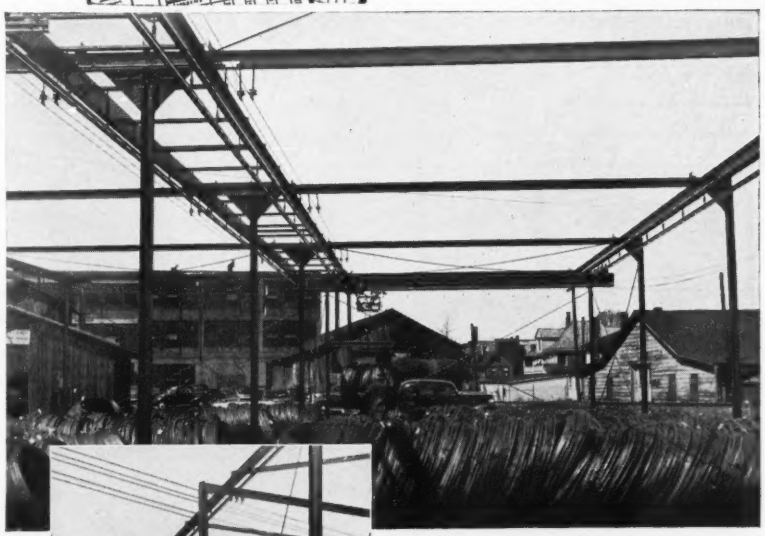
Variable Speed Pulleys

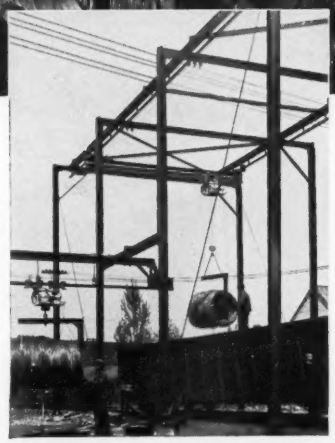
A NEW comprehensive folder on the SPEEDMASTER variable speed pulley has just been released by the Speedmaster Division of Continental Machines, Inc., 1301 Washington Avenue South, Minneapolis, Minnesota.

Now Is The Time To Become A Member Of The Wire Association.

THIS attractive four-page bulletin tells how stepless speed delivery may be obtained and illustrates practical user applications. It also offers engineering service in special problems pertaining to the attainment of variable speed. Copies may be had on request.

"Saves 32c per ton!" in handling cost - - -





Unloading and storing coiled rod from box cars formerly cost 40c per ton and required 5500 sq. ft. of warehouse space.

Now, raw coils are unloaded from gondolas, stored outside and handled through pickling to punches and cold-headers at 8c per ton.

A Clear Saving of 32c per Ton Made Possible by Overhead Handling

Innovations, such as a turntable for transferring coils between hoists, develop in conference with American MonoRail engineers.

AMERICAN MONORAIL CO.

13117 ATHENS AVE., CLEVELAND, OHIO

New Features of Spot Welding Machine

THE Eisler Engineering Company of Newark, New Jersey has recently developed a Universal Spot Welding Machine known as the Universal Welder No. 310. This new type of Spot Welding machine is similar to a Standard 10 KVA Spot Welder with sliding horns especially adaptable for all kinds of sheet metal work.

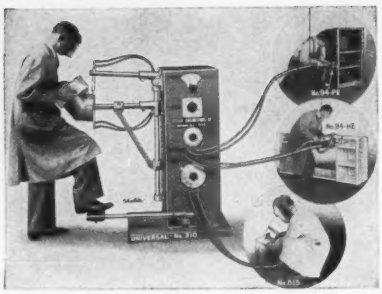
✦ ✦ ✦

THE new features on this machine are that on one machine not only Spot Welding, but also Push Welding, Gun Welding and Arc Welding can be performed.

✦ ✦ ✦

THE Universal Spot Welding Machine embodies the following features:

1. Conventional Type Spot Welding Machine, foot operated.
2. A. C. Transformer Type Arc Welding Machine.
3. Hand Operated Push Spot Welder.
4. Air Operated Gun Welder.



THE Spot Welding Machine can also be arranged air operated and the equipment is made for 25 - 40 - 50 - 60 cycles, 220, 440 or any other voltage.

✦ ✦ ✦

THE Machine is supplied with individual controls so that each operation can be performed without interfering with the other.

✦ ✦ ✦

THIS arrangement is made with a Spot Welder of 10 KVA, 20 KVA Capacity, 35 KVA, 50 KVA, 200 - 300 - 400 Amp. Arc Welder.

Glass Fiber Insulates New Appliance Wires

TWO Deltaglass 300-volt special purpose appliance wires insulated with glass fiber yarn have been introduced by General Electric Co., appliance and merchandise department, Bridgeport, Conn. One is a lead wire recommended for small electrical appliances. The other is Deltaglass waffle iron hinge wire recommended for flexible hinges.

✦ ✦ ✦

THE lead wire is insulated with saturated felted asbestos and a varnished glass yarn braid overall. It has high heat-resisting characteristics and high dielectric strength. It is resistant to abrasion and moisture, and is available in sizes Nos. 18 to 8 inclusive with either a solid or stranded conductor.

✦ ✦ ✦

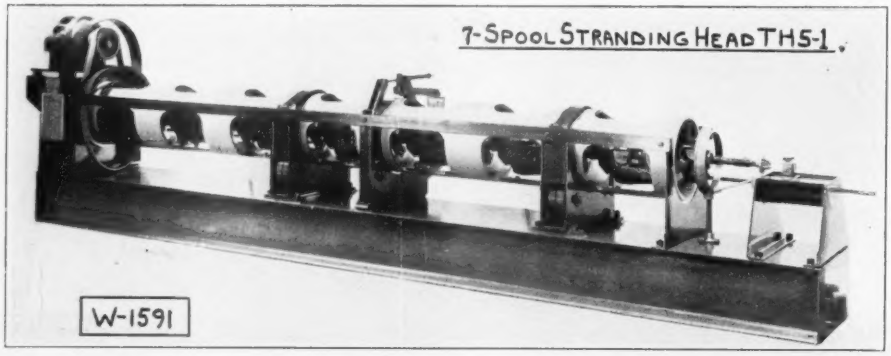
DELTAGLASS waffle iron hinge wire has a stranded nickel conductor with impregnated glass fiber insulation and an overall varnished glass braid. It is avail-

THE WATSON MACHINE COMPANY

ESTABLISHED 1845

PATERSON, NEW JERSEY, U. S. A.

TUBULAR STRANDING MACHINES
Standard Sizes For From 5 to 1000 Pound Spools
Silent Support Rolls—All Steel Rotor—Vee Belt Drive—Electric Stops
7 Second Brakes



ELECTRICAL WIRE, CABLE & WIRE ROPE MACHINERY
Printed Literature Available On Considerable Of The Equipment Used In These Fields—Inquiries Are Invited

able in size No. 18 only. This wire is small in diameter, flexible and abrasion-resistant. The glass insulation used for these wires consists of fine glass fibers less than 0.002-inch thick.

✦ ✦ ✦

Data Available On Wooden Tanks

PROBABLY the most complete catalogue on wooden tanks for every purpose has just been issued by the Hauser-Stander Tank Company, Cincinnati, Ohio.

✦ ✦ ✦

THIS catalogue (No. 40) consists of 100 pages of tank information including tables of dimensions and capacity, illustrations of various kinds of tanks, data relating to wood tanks, lead lined, rubber lined, Monel lined, stainless steel lined, etc.

✦ ✦ ✦

THERE is also included a study of the action of various chemicals upon different woods used for chemical tanks and a very complete set of specification suggestions for pickling tanks.

✦ ✦ ✦

THIS catalogue should be of real value to wire mill production men and a copy may be obtained by addressing the Editor of WIRE AND WIRE PRODUCTS.

✦ ✦ ✦

New Type Strand Annealer

(*Continued from Page 255*)

suring the ultimate user of receiving clean, bright wire, free from any stains and annealed uniformly from end to end of the reel according to the exact specifications on tensile strength and elongation given with the order.

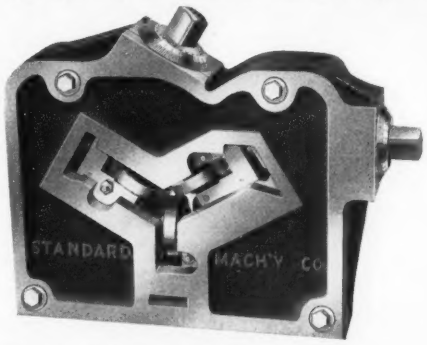
✦ ✦ ✦

THE engineering and selling organizations connected with the marketing of this unit announce it to be available in complete form for handling any of the above-mentioned duties for which open flame annealing equipment would be desired. The unit is being thoroughly covered by patent application.

"STANDARD" TURKS HEADS

(Adjustable Draw Plates)

Available for forming plain shapes from round to triangular or hexagonal; and, with shaped rolls, to form practically any irregular section. Rolls can be engraved to emboss ornamental designs on drawn stock . . . FRICTION DRIVEN TURKS HEADS can be mounted on any type of wire drawing equipment (or can be attached behind a rolling mill to square up edges) . . . POWER DRIVEN TURKS HEADS, one or two pairs of rolls driven, give higher rate of production, maximum reduction per pass (varies with stock used), and eliminate chatter marks.



Three roll Turks Heads for Triangular Stock

Write, stating your requirements (shape, stock, production, etc.) and we shall be glad to send specific recommendations, including price and delivery.

IT'S **STANDARD** PRACTICE

MACHINERY COMPANY
PROVIDENCE, RHODE ISLAND

Bell-Mine Pulverized **LIME**

WARNER COMPANY Lime Bell Mine Products BELLEFONTE DIVISION

FOR WIRE DRAWING

Because the pure limestone is deep mined 700 feet below surface at Bellefonte, is burned in large modern Rotary Kilns under constant engineering supervision, and the lime is check-tested by trained chemists in the Warner Laboratory at the plant

BELL-MINE LIME IS UNIFORM AND PURE

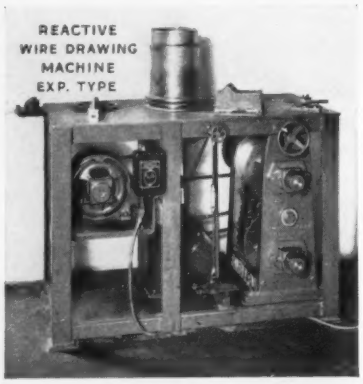
Warner Company

Bellefonte Division

Sales Offices: Pittsburgh, Philadelphia, Bellefonte, N. Y. City

AN ARTICLE IN THIS ISSUE ON
THE POWER SAVINGS ACHIEVED BY
REACTIVE WIRE DRAWING WILL
INTEREST YOU!

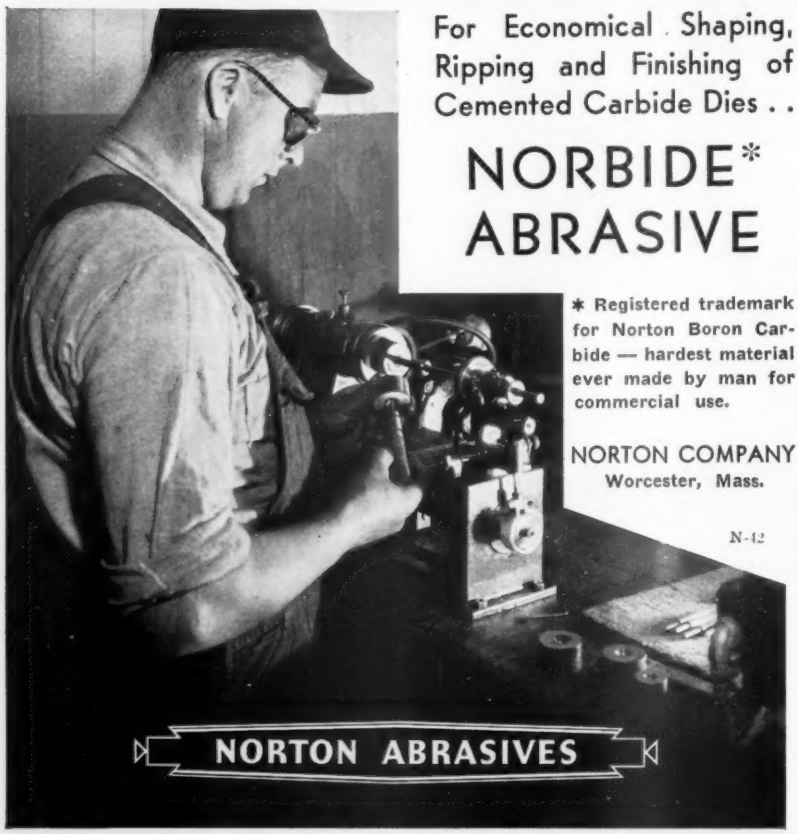
Less Power Per Ton — Lower Die Costs



More Speed — Lower Costs Per Ton

(Manufactured and sold under Smith-Stringfellow Patents)

REACTIVE WIRE DRAWING
Room #36, Central Exchange Bldg., Worcester, Mass.



For Economical Shaping, Ripping and Finishing of Cemented Carbide Dies . .

NORBIDE* ABRASIVE

* Registered trademark for Norton Boron Carbide — hardest material ever made by man for commercial use.

NORTON COMPANY
Worcester, Mass.

N-42

NORTON ABRASIVES

Modern Physics and Metallurgical Problems

WHILE some properties of metals can be calculated accurately on paper, the problem of tensile strength continues to baffle the scientist, **Dr. Saul Dushman** of the General Electric Research Laboratory said at a recent meeting of the Detroit chapter of the **American Society for Metals.** The ultimate tensile strengths of metals, he explained, are only one-tenth to one-hundredth of what theoretical calculations of the physicist say that they should be.

✦ ✦ ✦

"ON the basis of the electronic theory of atomic structure and quantum mechanics," **Dr. Dushman** said, "it is possible to account for the typical metallic properties such as electrical and thermal conductivity, the occurrence of magnetism for some of the metals, and observations on the relation between composition and phase pattern for a number of alloys.

✦ ✦ ✦

"IN the case of the alkali metals and copper it has been found possible to calculate heat of evaporation and compressibility from the known electron configurations of the atoms.

✦ ✦ ✦

"HOWEVER, such 'structure sensitive' properties as tensile strength, rate of creep under stress, especially at higher temperatures, phenomena of recrystallization and age-hardening, etc., cannot be interpreted on any purely atomic basis.

✦ ✦ ✦

"IT seems to be generally accepted that fine cracks or similar defects in crystalline structure account for the discrepancy between observed and calculated tensile strengths. For instance, the ultimate tensile strength increases with decrease in size of wire, with decrease in grain size, and with increase in cold working.

✦ ✦ ✦

"G. I. **Taylor, Becker, Orowan** and others have developed a theory of plastic deformation under stress and of rate of creep. The observations on effect of

temperature on ultimate tensile strength, rate of creep, and life to rupture are important, although we do not understand the significance of the observed 'activation energy.'

✦ ✦ ✦

"IS this activation energy connected with energy of diffusion? We know that diffusion governs rate of crystallization, also rate of alloy formation. Considerable work on this topic has been carried out by **Mehl** and his associates. The results have been applied to account for the observations on the rate of transformation of austenite as affected by temperature. In this connection the study of self-diffusion is of extreme importance. So far results have been obtained on only two or three metals. Diffusion also plays an important role in hardening phenomena.

✦ ✦ ✦

"CLOSELY allied with the phenomena of diffusion are the 'order-disorder' transformations in alloys which have been investigated by **Bragg** and others.

✦ ✦ ✦

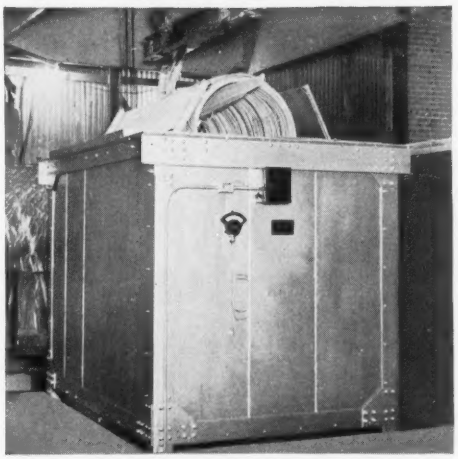
"THE observations in which the metallurgist is interested are so varied and so extremely complex that progress towards a satisfactory explanation must necessarily be slow. We are dealing in nearly all cases with phenomena in which the energy changes involved are relatively small, and to calculate them involves from the point of view of atomic structure, a consideration of second- and third-order perturbation effects. What we need at present is not so much a study of engineering materials as of pure metals and simple binary alloys."

✦ ✦ ✦

DR. DUSHMAN listed cohesion and plastic deformation as the most important metallurgical problems. He said that tensile strengths of metals are not only considerably less than those calculated on a theoretical basis but that tensile strength and other cohesive properties may be varied over large ranges by varying the composition, by heat treatment, and by mechanical working.

CARL-MAYER HI-SPEED TRADE MARK ROD BAKER

Far Ahead in comparative tests!



Large savings per pin in baking time.

Produces work of highest calibre.

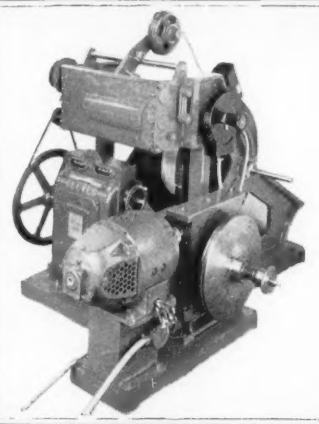
Heavy Duty Construction.

Carl-Mayer Hi-Speed Rod Bakers have a more efficient heating and ventilating system . . . The patented Blow-Off feature removes moisture without rolling, bumping or agitating the coils . . . Write for complete details.

Illustration shows a Carl-Mayer Hi-Speed Rod Baker in a large Canadian steel plant.

OVER 20 YEARS EXPERIENCE

The CARL-MAYER Corp.
3030 Euclid Ave., CLEVELAND, OHIO.



AIMco

30" REEL STANDS
INDIVIDUAL MOTOR DRIVEN

Traverse adjustable both for width of reel and rate, while outfit is in motion.

Traverse guide adjustable for width of wire being insulated.

Variable tension take up provided.

EST. 1855 AIMco INC. 1915

"American" AIMco INSULATING MACHINERY COMPANY

REG. U.S. PAT. OFF.

517 West Huntingdon St.
PHILADELPHIA PENNSYLVANIA U.S.A.

Learn about PARALAN

Paralan will give your finished wire and wire products protection from atmospheric corrosion in the mill and in shipping. Paralan-coated wire can be spot welded or soldered without cleaning. Also, Paralan leaves surfaces in good condition for all types of finishes—enameling, japanning, lacquering, plating, etc.

Write for further information. We may be able to solve your difficulties.

AMERICAN LANOLIN CORP.
LAWRENCE, MASSACHUSETTS

"STANDARD WIRE DRAW"
FOR HIGH-LOW CARBON, BRIGHT, COLD HEADING
WET WIRE DRAWING

- Lower die costs
- Better finished wire
- Lubricants specially adapted for drawing on high speed machines

EXPERIENCED SERVICE MEN WILL DEMONSTRATE
THE MERIT OF OUR PRODUCTS

STANDARD INDUSTRIAL COMPOUNDS CO.
4600 Ferdinand St. Chicago, Ill.

INVENTIONS — PATENTS

Interesting booklet, **General Information Concerning Inventions and Patents** and **Schedule of Government and Attorneys' Fees**, sent free on request. Simply ask for "booklet" and "fee schedule".

Lancaster, Allwine & Rommel
Registered Patent Attorneys
438 Bowen Bldg. Washington, D. C.

WIRE NAIL MACHINERY

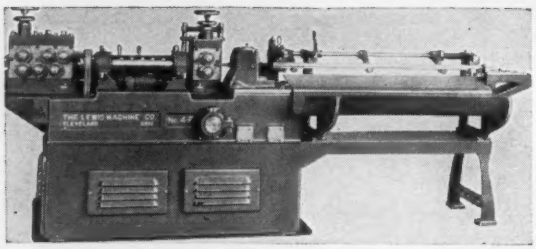
These machines are made in eleven different sizes. This enables us to cover any size of nail most efficiently.

GLADER Nail making machines have been adopted as standard equipment in all recent major nail mill installations.

For further information, prices, etc., write to us.

Wm. Glader Machine Works
210 N. RACINE AVENUE, CHICAGO, ILL.

LEWIS TRAVEL-CUT WIRE STRAIGHTENING and CUTTING Machines



Machines for 1/16" to 3/4" rod
Round
Square
Flat
Hexagon
Ferrous and Non-Ferrous

Automatic
High Speed
Heavy Duty

The Sign of Dependable Service:
WE CAN SUPPLY AND ENGINEER OUR TOOLS EQUIPPED WITH CARBOLOY CEMENTED CARBIDE

THE LEWIS MACHINE CO., 3445 E. 76 St., Cleveland, Ohio

Diamonds Blaze the Copper Trail

IN the February issue of the bulletin "Diamonds in Industry", published by J. K. Smit & Sons Inc., the following data regarding the use of industrial diamonds in the forming of pure copper was published:

✦ ✦ ✦

IN the forming of this pure copper, industrial diamonds find many uses. Probably the most important is the use of diamond dies of various kinds. Diamond dies, of course, are used in drawing all sorts of materials wherever the shape and diameter must be and remain as perfect as man can make them, from the finest gut used in leaders for fishing tackle to the stainless steel wire of the best pianos.

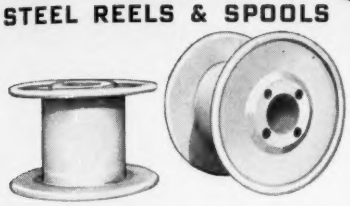
✦ ✦ ✦

WIRES are the **sine qua non** of modern communications and transportation. We talk over them, light our homes, offices and factories with them, receive our music, drama and news over wires. A diamond wire die used for drawing fine copper wire for all branches of the electrical industry is simply a thin slice of gem diamond set in a metal mount and drilled dead center with a hole of diameters varying with the gage of the wire to be drawn. Spools, shown in an illustration on page 1 which are revolved rapidly, pull the wire through the dies to the correct diameter. The precision involved makes diamonds a necessity, because the diamond is the only material hard enough to withstand continuous abrasion and retain the exact size of hole over a long period of time. Enough 20-gage copper wire to stretch around the world 24 times can be run through a diamond die before the hole suffers any measurable enlargement.

✦ ✦ ✦

IN drilling holes in these diamond dies, another diamond product must be used. "Diamond cuts diamond," according to the old Hindu proverb, and drilling a die involves upwards of thirty hours of hammering at the center of the stone with an alloy steel needle impregnated with diamond dust.

APCO MOSSBERG
STEEL REELS & SPOOLS



For The Copper, Steel, & Wire Rope Industry

Apco Mossberg Steel Reels are standard equipment in the wire industry—and for good reason! Apco Mossberg—the original Frank Mossberg Co.—**originated** the steel reel idea and have been training workmen in their manufacture ever since. Personal attention by Apco Mossberg engineers make each job a "special".

FREE ENGINEERING SERVICE

We will gladly submit drawings, blueprints, or suggestions without obligation to you. Write for quotation today.

APCO MOSSBERG CO.
(The Original Frank Mossberg Co.)
21 Lamb Street, Attleboro, Mass.

NEW 99% SOAP INSURES CORRECT LUBRICATION

Nopco's new Soap LX has been prepared especially for the dry drawing of steel wire. Its superiority is due to its actual soap content—99% active dry soap.

Because of this high pure soap content, Nopco Soap LX possesses plus values that will effect economy in your drawing operations.

Free from glycerine, salt or fillers of any kind, Nopco Soap LX insures correct lubrication with longer die life, better finish and higher yields per pound of soap.

Write for a Technical Data Bulletin or better still, order enough for a trial—see for yourself.

NOPCO
NATIONAL OIL PRODUCTS CO.
HARRISON, N. J.
BOSTON • CEDARTOWN, GA. • CHICAGO • SAN FRANCISCO

Reactive Drawing Results

(*Continued from Page 261*)

ventional drawing. This is partly due to a lessened friction, but there may be another contributing factor. The laws of thermodynamics would not forbid the performance of a stated amount of work on wire with apparently less than the assumed evolution of heat.

✦ ✦ ✦

THE back pulling on the reactive machine sets up an elastic stress in the wire, with evolution of heat which does not reach the die. When the stress is cancelled, as it is in the ensuing draft, there is a corresponding absorption of heat by the wire. In other words the prestressed wire is cooling the die. We do this operation daily in our Frigidaires, except that we use sulphur dioxide or ethyl chloride. We could, with vastly less efficiency, refrigerate our foods by stressing air-cooling, and then unstressing steel wires. It is not entirely fantastic to think of back-pull as cooling the wire, reducing its yield point, and so cutting down die pull.

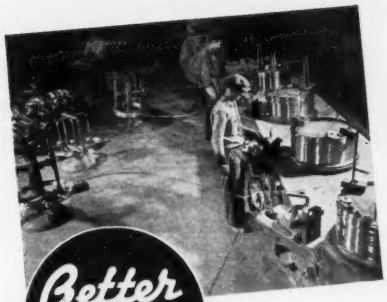
✦ ✦ ✦

GETTING down out of the clouds to summarize this discussion, I should say that Mr. Stringfellow's experiments are interesting. Savings in power are definitely promised by mathematics, and he has shown that in spite of inconsistencies and mysteries, the trend is that way. The savings will never be very great, and might almost be ignored, because the process promises greater advantages in the direction of physical properties, die life, and finish. The matter is of interest chiefly as it tends to validate theories and calculations previously published, including those that I set forth in these columns in October 1933.

✦ ✦ ✦

THE experiments bring out nothing new. In fact the reactive process is not basically new. It is merely an extremely simple, cheap, and ingenious way to apply back-pull under accurate and automatic control which responds instantaneously to changes in the

(*Please turn to Page 282*)



Better Drawing with MAGNUS DRY WIRE LUBRICANTS

Magnus Dry Wire Lubricants are finely divided and anhydrous to provide the best and most uniform coating. Their dryness and fineness allow a "rolling action" of the lubricant in the die box ensuring continuous contact with and even coating of the wire. They give materially increased tonnage per pound of drawing compound used. There is a type for every kind of wire and drawing operation.

GET THIS PERFORMANCE DATA

Ask for performance data from wire mills covering their experience with Magnus Wire Drawing Soaps and Greases.

MAGNUS CHEMICAL CO.
188 South Ave., Garwood, N. J.
MAGNUS CLEANERS

STEEL REELS AND DRUMS for WIRE AND CABLE INDUSTRY

R.B. HAYWARD CO.
1714 Sheffield Ave. Chicago, Ill.

Memo to Wire-Makers:

RODINE, in the pickling bath, saves acid and metal, minimizes brittleness, lowers pickling costs.

RODINE more than pays its way.

CUPRODINE creates a dense, bright, tight, uniform copper coating in a minimum of time. It is used in a simple immersion process.

American Chemical Paint Co.
Dept. 306, AMBLER, PENNA.
Detroit, Mich. Walkerville, Ont.

Reactive Drawing Results

(*Continued from Page 281*)

tenacity of the metal. Whatever advantages may inhere in prestressing are now within easy reach.

(Signed) Kenneth B. Lewis.

✦ ✦ ✦

Steel & Wire to Modernize Equipment at Donora, Pa.

AMERICAN STEEL & WIRE CO., will spend about $520,000 for modernization of its wire drawing facilities at Donora, Pa. Work is scheduled to begin soon and will require about six months of completion.

✦ ✦ ✦

STEAM operated equipment in the wire drawing department will be replaced by new electrically operated wire drawing machinery and auxiliary equipment. Some of the outmoded machinery is 35 years old. It is understood the work will be done without completely shutting down the plant.

BALLOFFET

Diamond Dies

Skill and accuracy in manufacture with the use of selected stones make Balloffet Diamond Dies the choice of the most critical users.

●

Quality Diamond Dies Since 1870

BALLOFFET DIES AND NOZZLE CO., INC.
45-47 Adams Street
Guttenberg, New Jersey

WILLEY'S
SIZING, EXTRUSION
WIRE DRAWING DIES

A TUNGSTEN Carbide Metal that will produce a super fine finish with intensive resistance to abrasion.

Your assurance for accuracy and long life production at high speeds.

Sales engineers in principal cities.
Write for Catalogue showing latest price reduction.

WILLEY'S CARBIDE TOOL CO.
MANUFACTURERS AND SPECIALISTS IN
TUNGSTEN CARBIDE TOOLS
1340 W. VERNOR HIGHWAY • DETROIT, MICHIGAN

This is an invitation for you to become a member of The Wire Association.
The Annual Dues are $10.00
✦ ✦ ✦
The 1940 Convention will be held in October at Cleveland, O.
✦ ✦ ✦
For Details Address
Richard E. Brown, Secretary
The Wire Association
300 Main St. Stamford, Conn.
Stamford Trust Co. Bldg.

Wire Drawing Machinery

Featuring —
High Speed Upright Cone Machines.
Also —
Bull Blocks and Benches, Continuous Wire Drawing Machines, Spoolers, Pointers, String-up Machines, etc.
And —
Cold Heading Machinery.

WATERBURY FARREL FOUNDRY & MACHINE CO.
Waterbury, Conn.

STEELSKIN
REG. U. S. PAT OFFICE
For High or Low Carbon Wire
WIRE DRAWING SOAPS
Established 30 years
R. H. MILLER CO., Inc. · Homer, N. Y.

Use Pittsburgh Wires for *Every* Fabricating Purpose
PITTSBURGH STEEL COMPANY
1641 GRANT BUILDING PITTSBURGH, PA.

WANTED

FOREMAN—for wire drawing equipment, preferably non-ferrous. Write stating age, experience, salary required, etc. Address Box 318 c/o

WIRE & WIRE PRODUCTS

Hy-Carbo Steel Co.
Est. 1917
✦ ✦ ✦
HIGH GRADE CUSTOM WIRE DRAWING
Less Ton Lots A Specialty
✦ ✦ ✦
LOWELL, MASS.

Continuous Straightening and Cutting Machinery
With
FLYING SHEAR
for round and shaped wire.
✦ ✦ ✦
THE HALLDEN MACHINE COMPANY
THOMASTON CONNECTICUT

Wire Drawing Diamond Dies
COCHAUD
WIRE DIE CORPORATION
300 W. 56th St., NEW YORK
Tel. Col. 5-1340

Macwhyte Company Holds Annual Employee, Management, Stockholder Banquet

EMPLOYEES hear details of company operations.

✦ ✦ ✦

AT their annual employee-management-stockholder banquet on March 23, Macwhyte Wire Rope Company revealed sales and financial progress during the past year.

✦ ✦ ✦

ONCE a year this company gives a dinner for all employees and stockholders. Following the dinner, a report is made by the management covering more details than many companies furnish their bankers.

✦ ✦ ✦

GOLD watches are given 25-year employees, and service certificates are given to 5, 10, 15, and 20-year men.

✦ ✦ ✦

CHARTS are used to picture the company's business activities and finances. Figures are not shown in percentages—they are actual figures taken from the books of the company.

✦ ✦ ✦

ALL employees in Macwhyte Wire Rope Company are real co-workers; they know how the company operates and are sympathetic and loyal. This is shown by the unusual record of more than 10 years' service for each of 50% of the employees, and 30% of them have a service record of 15 years and over.

WANTED

PLANT SUPERINTENDENT — Thoroughly familiar with all types rubber insulated wire and cables. Responsible position requiring good judgment and executive ability. Excellent opportunity for right man. Reply, stating full particulars. Address BOX 317, c/o

WIRE & WIRE PRODUCTS

GEORGE D. HARTLEY
CONSULTANT
ON
SPRING MAKING
AND
WIRE WORKING
MACHINES & METHODS
311 MAIN ST.
WORCESTER, MASS.

KENNETH B. LEWIS
CONSULTING ENGINEER
Wire Mill Equipment, Layout and Practice
43 Midland St., Worcester, Mass.
Phone: Worcester 5-6033

WIRE MACHINERY SPECIALISTS
3—Nilson No. 1, 3 & 4 4 Slide Wire Machines
2—Baird No. 3 & S3F 4 Slide Wire Machines
7—Waterbury Step Cone Wire Drawing Machines
1—Two Spindle Bull Block Motor Driven
6—Lewis Welding Wire S & C Machines M. D.
2—Shuster Shaped Wire S & C Machines ½" & ¾"
8—Shuster Round Wire S & C Machines 1/32"-½"
Wanted: Tack Making Machinery. All Sizes.
NATIONAL MACHINERY EXCHANGE
128-138 MOTT ST. NEW YORK, N. Y.

UNIVERSAL WIRE REEL
Quickly and easily adjusted to any angle within 90 degrees. Cut shows one angle.
Write for circular R
THE F. B. SHUSTER CO.
New Haven, Conn.
Straightener Specialists Since 1866

Largest Stocks in U. S. A.
VIANNEY
Famous Wire Drawing Diamond Dies
250 E. 43rd St., New York

EYELETS
ZINC WIRE
ZINC STRIP
THE PLATT BROS. & CO.
WATERBURY, CONN.

Designers and Builders of Gas-Fired Heat Treating Furnaces for Ferrous and Non-Ferrous Wire.
SURFACE COMBUSTION CORPORATION
Main Plant and General Offices—Toledo, Ohio

RUESCH
Machinery For
Wire, Tube, and Brass Mills
409 Mulberry St., Newark, N. J.

DIAMOND CARBIDE
DIES
KELLY
WIRE DIE CORPORATION
19 W. 34th St. New York

WIRE DRAWING MACHINERY
AND EQUIPMENT
Rod Frames — 16" Frames, 8"
Frames — Take-Up Frames, Wire
Pointers — Puller Tongs.
General Castings for Wire Mill use.
Circulars on Request.
E. J. SCUDDER FOUNDRY &
MACHINE CO.
TRENTON, N. J.

FOR DIAMOND AND
CARBIDE WIRE
DRAWING DIES SEE
RUSCH WIRE DIE CORPORATION
275 Seventh Ave., New York, N. Y.

BRODEN
Wire Mill and Cold
Rolling Equipment
Broden Construction Co.
11730 Harvard Ave.
CLEVELAND, OHIO

TANKS
FOR EVERY MILL OPERATION
CLEANING—PICKLING—PLATING.
LEAD LINING RUBBER LINING
THE HAUSER-STANDER TANK CO.
CINCINNATI, OHIO

ROSS ROD WIRE BAKER
J. O. ROSS ENGINEERING CORP.
350 Madison Avenue, New York, N. Y.
CHICAGO DETROIT PITTSBURGH, PA.

SCOTT TESTERS
For WIRE, RUBBER, TEXTILES, PAPER, Etc.
HENRY L. SCOTT CO.
PROVIDENCE, R. I.

Rusting in Transit

(*Continued from Page 254*)

ing in transit occurs most frequently in summer, that is, between the vernal and autumnal equinoxes, which is the period of sharpest temperature changes.

✦ ✦ ✦

OF course, air conditioning at both the seller's and the buyer's plants is a long step in the direction of security, but it can never give absolute security so long as wire must be transported from plant to plant in a closed vehicle whose atmosphere is subject to nobody's control.

✦ ✦ ✦

Economic Trends Favorable to Revival ot Bessemer Process In Steel Making

(*Continued from Page 264*)

TURNING from his discussion of the determination of the end-point and the mechanical and operating features of the process, Mr. Graham concluded with a discussion of the more purely metallurgical phases of the Bessemer blow, pointing out how methods for control of these phases are rapidly being developed on a basis that promises to bring the Bessemer process up to the quality level of other steel making methods.

✦ ✦ ✦

Skein Reeling Machine

A CATALOGUE describing The Twin Unit System of Reeling, as developed by the Fidelity Machine Company, 3908 Frankford Avenue, Philadelphia, Pa., and containing description of the Fidelity Skein Reeling Machine, has just been issued.

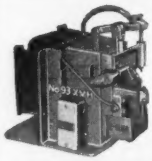
✦ ✦ ✦

COPIES of the catalogue may be obtained by addressing the Editor of WIRE & WIRE PRODUCTS.

ROYLE
PATERSON N J
BUILDING EXTRUDERS SINCE 1880
Royle insulating, straining and tubing machinery --- famous fifty years.
JOHN ROYLE & SONS
PATERSON, N. J.
British Agency: James Day (Machinery) Ltd., Sentinel House, Southampton Row, London, W. C. 1, England

MANUFACTURERS OF
WIRE BRAIDING — SPOOLING — TAPING
WINDING AND SPECIAL MACHINES
SINFRA WIRE COVERING MACHINES
FIDELITY MACHINE CO.
3908-18 Frankford Ave., Phila., Pa.

SPARK - TESTING
EQUIPMENT
FOR
INSULATED WIRE AND RUBBER HOSE
JAMES L. ENTWISTLE
43 CHURCH ST. PAWTUCKET, R. I.


We manufacture Electric Spot Welders from ¼ to 500 K.V.A. We also make standard and special Transformers of all kinds. A.C. Arc Welders from 100 to 400 Amps.
Eisler Engineering Co.
CHAS. EISLER, Pres.
764 So. 13th St. (Near Avon Ave.)
Newark, New Jersey

WIRE, WIRE ROPE AND ELECTRIC CABLE MACHINERY
THOMSON-JUDD
WIRE MACHINERY COMPANY
SUBSIDIARY OF
THOMSON-GIBB ELECTRIC WELDING COMPANY
LYNN, MASSACHUSETTS
WRITE FOR CATALOGUE

Wire Measuring Machines
For accurate lineal measuring of bare and insulated wire and cable .005 in. dia. up. Braiding Machine Counters.
DURANT MFG. CO.
1918 N. Buffum St. 176 Eddy St.
Milwaukee, Wis. Productimeters Providence, R. I.
THE SPEEDOMETERS OF INDUSTRY

Everything for the
Wire and Cable Industry.
Let us estimate on your needs!
NEW ENGLAND BUTT CO.
PROVIDENCE, R. I.

"THE SHIFTWEIGHT"
TILTING WIRE REEL
One man loading reel = for wire coils up to 300 pounds.
MOSLO MACHINERY, INC.
CLEVELAND, OHIO

Index to Advertisers

A

American Chemical Paint Co. 282
American Insulating Machinery Co. 279
American Lanolin Co. 279
American Monorail Co. 275
Apco-Mossberg Co. 281

B

Balloffet Dies & Nozzle Co., Inc. 282
Bethlehem Steel Corp. 244
Broden Construction Co. 284

C

Carl-Mayer Corp., The 279
Carboloy Company, Inc. 237
Cleveland Tramrail Div. of Cleveland Crane & Eng. Co. 273
Cochaud Wire Die Corp. 283
Continental Steel Corp. 269

D

Drever Co. 239
Durant Mfg. Co. 284

E

Eisler Engineering Co., Inc. 284
Electric Furnace Co., The ..... Back Cover
Entwistle, Jas. L. 284

F

Fidelity Machine Co. 284
Firth-Sterling Steel Co. 248-262-263

G

Glader, Wm., Machine Works 280

H

Hallden Machine Co., The 283
Hartley, Geo. D. 283
Hauser-Stander Tank Co., The 284
Hayward Co., R. B. 281
Hudson Wire Company 240
Hy-Carbo Steel Co. 283

K

Kelly Wire Die Corp. 284
Keystone Steel & Wire Co. 267

L

Lancaster, Allwine & Rommel 280
Lee Wilson Engineering Co. ..... Inside Front Cover
Lewis, K. B. 283
Lewis Machine Co., The 280

M

Magnus Chemical Co. 281
Micro Products Corp. 266
Miller Co., R. H. 282
Morgan Construction Co. 246
Morrison Engineering Corp. 272
Moslo Machinery, Inc. 284
Mossberg Pressed Steel Corp. 274

N

National Machinery Exchange 283
National Oil Products Co. 281
National Rubber Machinery Co. 270
New England Butt Co. 284
Norton Company 278

P

Pittsburgh Steel Co. 283
Platt Brothers & Co. 284

R

Reactive Wire Drawing 278
Robertson, John, Co., Inc. 268
Ross Engineering Corp., J. O. Division of Ross Industries Corp. 284
Royle, John, & Sons 284
Ruesch Machine Co., H. J. 284
Rusch Wire Die Corp. 284

S

Scott, H. L., Co. 284
Scudder Foundry & Machine Co., E. J. 284
Seymour Mfg. Co. 245
Shuster, F. B., Co., The 283
Sleeper & Hartley, Inc. 253
Standard Industrial Compounds Co. 280
Standard Machinery Co. 277
Stevens Metal Products Co. 247
Surface Combustion Corp. 284
Syncro Machine Co. 271

T

Thomson-Judd Wire Machinery Co. 284
Torrington Manufacturing Co., The 241

V

Vascoloy-Ramet Corp. 243
Vaughn Machinery Co., The ..... Front Cover
Vianney Wire Die Works 283

W

Warner Co., The 277
Waterbury Farrel Fdy. & Machine Co., The 282
Watson Machine Co., The 276
Willey's Carbide Tool Co. 282

New Members of The Wire Association To March 30, 1940

BICKLE, E. H., Sales Manager,
Canadian Steel Corp., Ltd.,
Walkerville, Ontario, Canada.

BURNS, J. L., Supt. Wire Mill,
Republic Steel Corp.,
South Chicago, Ill.

CRUM, E. JEFFERSON, Foreman,
Rod & Wire Division,
Bethlehem Steel Company,
Sparrows Point, Maryland.

DETWILER, JOHN G., V. P. & Gen. Mgr.,
Central Cable Company,
Jersey Shore, Penna.

DREVER, HORACE, President,
The Drever Company,
Philadelphia, Penna.

ESPOSITO, RALPH, Dist. Repr.,
Vascoloy-Ramet Corporation,
Cleveland, Ohio.

GARRATT, FRANK E., Vice Pres. & Tech. Dir.,
Universal-Cyclops Steel Corp.,
Bridgeville, Pa.

GASTON, ROY G., Gen. Foreman,
Bethlehem Steel Company,
Johnstown, Penna.

GORE, THOMAS, Owner,
T. Gore, Inc.,
Brooklyn, N. Y.

HANNON, C. H., Met.,
Works Laboratory,
General Electric Co.,
Pittsfield, Mass.

HUGHES, HARRY, Salesman,
Pittsburgh Steel Company,
Dayton, Ohio.

JOHNS, C. N., Vice President,
American Chain & Cable Co., Inc.,
New York, New York.

JOHNSON, WILLARD J., Salesman,
National Rubber Machinery Co.,
Clifton, New Jersey.

LONGELY, TRUMAN E., Dist. Repr.,
Vascoloy-Ramet Corporation,
Cleveland, Ohio.

McINERNEY, W. I., Supt.,
Heat Treating & Cold Drawing Depts.,
Pittsburgh Crucible Steel Co.,
Midland, Penna.

MEHL, CHAS. R., President,
Standard Industrial Compounds Co.,
Chicago, Illinois.

MOSTON, J. C.
"ALDERBRIAR", 174 Palatine Road,
West Didsbury, Manchester 20, England.

MOYER, R. F., Vice President,
Standard Machinery Company,
Providence, Rhode Island.

NEWMAN, R. K., Plant Mgr.,
Union Drawn Steel Division,
Republic Steel Corporation,
Hartford, Conn.

OLSON, A. A., Asst. Supt.,
Rod & Wire Divisions,
Bethlehem Steel Company,
Johnstown, Penna.

PETIX, JOSEPH M., Sales Engr.,
J. O. Ross Engineering Co.,
New York, N. Y.

PETTERSON, ARTHUR, Vice President,
Thomson-Judd Wire Machinery Co.,
Lynn, Mass.

SEIBERT, JOHN C., Met.,
Bethlehem Steel Company,
Johnstown, Penna.

SMITH, JAMES A., Asst. Gen. Supt.,
Copperweld Steel Company,
Glassport, Penna.

SPARGO, WM.,
Spargo Wire Company,
Rome, New York.

SPELLMAN, R. W., Dist. Repr.,
Vascoloy-Ramet Corporation,
West Hartford, Conn.

WHITTEN, J. L., Sales Mgr.,
Lee Wilson Engr'g. Co.,
Cleveland, Ohio.

Signal Corps Places Educational Order

THE New York Signal Corps Procurement District announces that the following companies have received educational orders for 100 miles each of Signal Corps field wire Type W-110-B.

GENERAL ELECTRIC COMPANY,
Schenectady, New York

COLLYER INSULATED WIRE COMPANY,
Pawtucket, Rhode Island

ROME CABLE CORPORATION,
Rome, New York

CRESCENT INSULATED WIRE & CABLE COMPANY,
Trenton, New Jersey

JOHN A. ROEBLING'S SONS CO.,
New York City

CIRCLE WIRE & CABLE CORPORATION,
Maspeth, L. I.

BELDEN MANUFACTURING COMPANY,
Chicago, Illinois

ANACONDA WIRE & CABLE COMPANY,
New York City

THE OKONITE COMPANY,
(Hazard Ins. Wire Works Div.),
Wilkes-Barre, Pa.

PHELPS DODGE COPPER PRODUCTS CORP.,
(Habirshaw Cable & Wire Div.),
New York City

THE AMERICAN STEEL & WIRE CO.
New York City

UNITED STATES RUBBER COMPANY,
New York City

WHERE TO BUY

For more complete information, consult the annual Wire and Wire Products Directory, Index & Buyers' Guide.

ABRASIVES—
Norton Co., Worcester, Mass.

AIR DRAW FURNACES—
Carl Mayer Corp., The, Cleveland, Ohio.

ANNEALING POTS AND BOXES—
Scudder, E. J. Fdry. & Machine Co., Trenton, N. J.

ANTI-RUST—Compound
Magnus Chemical Co., Garwood, N. J.
National Oil Products Co., Harrison, N. J.

ARMORING EQUIPMENT—
American Insulating Mach'y. Co., Phila., Pa.
New England Butt Co., Providence, R. I.
Sleeper & Hartley, Inc., Worcester, Mass.
Syncro Machine Co., Rahway, N. J.
Watson Machine Co., Paterson, N. J.

AUTOMATIC SPARK TESTING EQUIPMENT—
Entwistle, James L., Pawtucket, R. I.

BAKERS—Flash
Morrison Engineering Corp., Cleveland, O.

BAKERS—Hi-Speed
Carl-Mayer Corp., The, Cleveland, Ohio.

BAKERS—Rod and Wire
Carl-Mayer Corp., The, Cleveland, O.
Morgan Construction Co., Worcester, Mass.
Morrison Engineering Corp., Cleveland, O.
Moslo Machinery, Inc., Cleveland, O.
Ross Engineering Corp., J. O., New York, N. Y.

BOBBINS—Braider and Wire Weaving
Apco Mossberg Co., Attleboro, Mass.
Mossberg Pressed Steel Corp., Attleboro, Mass.

BORON CARBIDE—
Norton Co., Worcester, Mass.

CARRIERS—Braider, High Speed
Apco Mossberg Co., Attleboro, Mass.
Mossberg Pressed Steel Corp., Attleboro, Mass.

CEMENT FLOOR CLEANER—
Magnus Chemical Co., Garwood, N. J.

CEMENTS—Refractory
Norton Co., Worcester, Mass.

CHEMICALS—Cleaning
American Chemical Paint Co., Ambler, Pa.
Magnus Chemical Co., Garwood, N. J.
Standard Industrial Compounds Co., Chicago, Ill.

CLEANERS—Hand and Metal
Magnus Chemical Co., Garwood, N. J.

CLEANING & PICKLING EQUIPMENT—
Broden Construction Co., Cleveland, O.
Cleveland Tramrail Div. of the Cleveland Crane & Engineering Co., Wickliffe, Ohio.
Hauser-Stander Tank Co., Cincinnati, O.
Lee Wilson Engineering Co., Cleveland, Ohio
Morgan Construction Co., Worcester, Mass.
Vaughn Machinery Co., Cuyahoga Falls, O.

CLOTH TESTERS—
Scott, Henry L., Co., Providence, R. I.

COATING—Protective
American Lanolin Corp., Lawrence, Mass.
National Oil Products Co., Harrison, N. J.

COILERS—Sheet, Strip and Wire
Broden Construction Co., Cleveland, O.
Ruesch, H. J., Machine Co., Newark, N. J.
Torrington Mfg. Co., The, Torrington, Conn.

COILERS AND SPOOLERS FOR INSULATED WIRES—
Entwistle, James L., Pawtucket, R. I.

COMPOUNDS—Wire Drawing
Magnus Chemical Co., Garwood, N. J.
National Oil Products Co., Harrison, N. J.
Standard Industrial Compounds Co., Chicago, Ill.

COPHOLDERS—Steel
Apco Mossberg Co., Attleboro, Mass.
Mossberg Pressed Steel Corp., Attleboro, Mass.

CRANES—Wire Mill
American Monorail Co., Cleveland, O.
Cleveland Tramrail Div. of Cleveland Crane & Engineering Co., Wickliffe, O.
Morgan Construction Co., Worcester, Mass.
Vaughn Machinery Co., Cuyahoga Falls, O.

CUSTOM WIRE DRAWING—
Hy-Carbo Steel Co., Lowell, Mass.

CUTTING TOOLS—Carbide
Carboloy Co., Inc., Detroit, Mich.
Firth-Sterling Steel Co., McKeesport, Pa.
Vascoloy-Ramet Corp., North Chicago, Ill.

DIAMOND POWDERS—
Rusch Wire Die Corp., New York, N. Y.

DIAMOND TOOLS—
Rusch Wire Die Corp., New York, N. Y.

DIES—Diamond
Balloffet Dies & Nozzle Co., Inc., Guttenberg, N. J.
Cochaud Wire Die Co., New York, N. Y.
Kelly Wire Die Corp., New York, N. Y.
Rusch Wire Die Corp., New York, N. Y.
Vianney Wire Die Works, New York, N. Y.
Willey's Carbide Tool Co., Detroit, Mich.

DIES—Lead Extrusion
Robertson, John, Co., Brooklyn, N. Y.

DIES—Repairs & Re-Cutting
Balloffet Dies & Nozzle Co., Inc., Guttenberg, N. J.
Carboloy Co., Inc., Detroit, Mich.
Cochaud Wire Die Co., New York, N. Y.
Firth-Sterling Steel Co., McKeesport, Pa.
Kelly Wire Die Corp., New York, N. Y.
Rusch Wire Die Corp., New York, N. Y.
Vascoloy-Ramet Corp., North Chicago, Ill.
Vianney Wire Die Works, New York, N. Y.
Willey's Carbide Tool Co., Detroit, Mich.

DIES—Rod and Tube Drawing
Balloffet Dies & Nozzle Co., Inc., Guttenberg, N. J.
Carboloy Co., Inc., Detroit, Mich.
Firth-Sterling Steel Co., McKeesport, Pa.
Kelly Wire Die Corp., New York, N. Y.
Rusch Wire Die Corp., New York, N. Y.
Vascoloy-Ramet Corp., North Chicago, Ill.
Vianney Wire Die Works, New York, N. Y.
Willey's Carbide Tool Co., Detroit, Mich.

DIES—Tantalum Carbide
Balloffet Dies & Nozzle Co., Inc., Guttenberg, N. J.
Carboloy Co., Inc., Detroit, Mich.
Firth-Sterling Steel Co., McKeesport, Pa.
Kelly Wire Die Corp., New York, N. Y.
Rusch Wire Die Corp., New York, N. Y.
Vascoloy-Ramet Corp., North Chicago, Ill.
Vianney Wire Die Works, New York, N. Y.

DIES—Tungsten Carbide
Balloffet Dies & Nozzle Co., Inc., Guttenberg, N. J.
Carboloy Co., Inc., Detroit, Mich.
Firth-Sterling Steel Co., McKeesport, Pa.
Kelly Wire Die Corp., New York, N. Y.
Rusch Wire Die Corp., New York, N. Y.
Vascoloy-Ramet Corp., North Chicago, Ill.
Vianney Wire Die Works, New York, N. Y.
Willey's Carbide Tool Co., Detroit, Mich.

DRAW BENCHES—
Ruesch, H. J., Machine Co., Newark, N. J.
Scudder, E. J., Fdry. & Machine Co., Trenton, N. J.
Standard Machinery Co., Providence, R. I.
Vaughn Machinery Co., Cuyahoga Falls, O

DRUMS—Flange Steel
Stevens Metal Products Co., Niles, O.

DRUMS—Vulcanizing
Mossberg Pressed Steel Corp., Attleboro, Mass.

ENGINEERS—Consulting Wire Mill
Hartley, George D., Worcester, Mass.
Lewis, Kenneth B., Worcester, Mass.

EQUIPMENT—Insulation Testing
Entwistle, James L., Pawtucket, R. I.

EYELETS—Brass or Zinc
Platt Bros. & Co., The, Waterbury, Conn.

FLASH BAKERS—
Morrison Engineering Corp., Cleveland, O.

FURNACES—Annealing
Carl-Mayer Corp., The, Cleveland, O.
Electric Furnace Co., Salem, O.
Lee Wilson Engineering Co., Cleveland, Ohio
Surface Combustion Corp., Toledo, Ohio.

FURNACES—Automatic
Carl Mayer Corp., The, Cleveland, Ohio.
Electric Furnace Co., Salem, O.
Lee Wilson Engineering Co., Cleveland, Ohio
Surface Combustion Corp., Toledo, Ohio.

FURNACES—Brazing
Electric Furnace Co., Salem, O.
Firth-Sterling Steel Co., McKeesport, Pa.

FURNACES—Bright Annealing
Electric Furnace Co., Salem, O.
Lee Wilson Engineering Co., Cleveland, Ohio
Surface Combustion Corp., Toledo, Ohio.

FURNACES—Electric
Electric Furnace Co., Salem, O.
Surface Combustion Corp., Toledo, Ohio.

FURNACES—Galvanizing
Lee Wilson Engineering Co., Cleveland, Ohio

FURNACES—Hardening and Tempering
Carl Mayer Corp., The, Cleveland, Ohio.
Electric Furnace Co., Salem, O.
Surface Combustion Corp., Toledo, Ohio.

FURNACES—Lead Melting
Electric Furnace Co., Salem, O.
Robertson, John, Co., Brooklyn, N. Y.
Surface Combustion Corp., Toledo, Ohio.

FURNACES—Non-Oxidizing
Carl-Mayer Corp., The, Cleveland, Ohio.
Electric Furnace Co., Salem, O.
Surface Combustion Corp., Toledo, Ohio.

FURNACES—Normalizing
Carl-Mayer Corp., The, Cleveland, Ohio.
Electric Furnace Co., Salem, O.
Surface Combustion Corp., Toledo, Ohio.

FURNACES—Salt Bath
Electric Furnace Co., Salem, O.
Surface Combustion Corp., Toledo, Ohio.

FURNACES—Wire, Strip & Sheet
Carl-Mayer Corp., The, Cleveland, Ohio.
Electric Furnace Co., Salem, O.
Lee Wilson Engineering Co., Cleveland, O.
Morrison Engineering Corp., Cleveland, O.
Surface Combustion Corp., Toledo, Ohio.

GALVANIZING EQUIPMENT—
Lee Wilson Engineering Co., Cleveland, Ohio

GRINDERS—ROLL
Norton Co., Worcester, Mass.

HI-SPEED BAKERS—
Carl-Mayer Corp., The, Cleveland, Ohio.

HOISTS—Electric Traveling
American Monorail Co., Cleveland, O.
Cleveland Tramrail Div. of the Cleveland Crane & Engineering Co., Wickliffe, Ohio.

INHIBITORS—
American Chemical Paint Co., Ambler, Pa.
National Oil Products Co., Harrison, N. J.

INSTRUMENTS—Electrical
Entwistle, James L., Pawtucket, R. I.

LATHES—Die Reaming
Morgan Construction Co., Worcester, Mass.
Vaughn Machinery Co., Cuyahoga Falls, O.

LIME—
Warner Co., The, Bellefonte, Pa.

LUBRICANTS—For Metal Cutting, Stamping and Drawing
Magnus Chemical Co., Garwood, N. J.
Miller Co., R. H., Homer, N. Y.
National Oil Products Co., Harrison, N. J.
Standard Industrial Compounds Co., Chicago, Ill.

LUBRICANTS—Wire Drawing
Magnus Chemical Co., Garwood, N. J.
Miller Co., R. H., Homer, N. Y.
National Oil Products Co., Harrison, N. J.
Standard Industrial Compounds Co., Chicago, Ill.

MACHINERY—Armoring (Cable, Wire Hose)
American Insulating Mach'y. Co., Phila., Pa.
New England Butt Co., Providence, R. I.
Robertson, John, Co., Brooklyn, N. Y.
Sleeper & Hartley, Inc., Worcester, Mass.
Syncro Machine Co., Rahway, N. J.
Thomson-Judd Wire Machinery Co., Sub. of Thomson-Gibb Electric Welding Co., Lynn, Mass.
Torrington Mfg. Co., The, Torrington, Conn.
Watson Machine Co., Paterson, N. J.

MACHINERY—Braiding
Fidelity Machine Co., Philadelphia, Pa.
New England Butt Co., Providence, R. I.
Watson Machine Co., Paterson, N. J.

MACHINERY—Brazing
Thomson-Judd Wire Machinery Co., Sub. of Thomson-Gibb Electric Welding Co., Lynn, Mass.

MACHINERY—Bunching
American Insulating Mach'y. Co., Phila., Pa.
New England Butt Co., Providence, R. I.
Sleeper & Hartley, Inc., Worcester, Mass.
Syncro Machine Co., Rahway, N. J.
Watson Machine Co., Paterson, N. J.

MACHINERY—Bundling, Scrap
Sleeper & Hartley, Inc., Worcester, Mass.
Vaughn Machinery Co., Cuyahoga Falls, O.
Watson Machine Co., Paterson, N. J.

MACHINERY—Cable, Electric
American Insulating Mach'y. Co., Phila., Pa.
Entwistle, James L., Pawtucket, R. I.
Fidelity Machine Co., Philadelphia, Pa.
New England Butt Co., Providence, R. I.
Syncro Machine Co., Rahway, N. J.
Thomson-Judd Wire Machinery Co., Sub. of Thomson-Gibb Electric Welding Co., Lynn, Mass.
Torrington Mfg. Co., The, Torrington, Conn.
Watson Machine Co., Paterson, N. J.

MACHINERY—Chain Making
Vaughn Machinery Co., Cuyahoga Falls, O.

MACHINERY—Closing
New England Butt Co., Providence, R. I.
Torrington Mfg. Co., The, Torrington, Conn.
Watson Machine Co., Paterson, N. J.

MACHINERY—Coil Winding
Sleeper & Hartley, Inc., Worcester, Mass.
Syncro Machine Co., Rahway, N. J.
Torrington Mfg. Co., The, Torrington, Conn.

WHERE TO BUY, Continued

MACHINERY—Coilers
Broden Construction Co., Cleveland, O.
Entwistle, James L., Pawtucket, R. I.
Morgan Construction Co., Worcester, Mass.
New England Butt Co., Providence, R. I.
Ruesch, H. J., Machine Co., Newark, N. J.
Sleeper & Hartley, Inc., Worcester, Mass.
Syncro Machine Co., Rahway, N. J.
Torrington Mfg. Co., The, Torrington, Conn.
Waterbury-Farrel Fdry. & Machine Co., Ansonia, Conn.
Watson Machine Co., Paterson, N. J.

MACHINERY—Copper Wire Drawing and Rolling
Ruesch, H. J., Machine Co., Newark, N. J.
Syncro Machine Co., Rahway, N. J.
Torrington Mfg. Co., The, Torrington, Conn.
Vaughn Machinery Co., Cuyahoga Falls, O.
Waterbury-Farrel Fdry. & Machine Co., Waterbury, Conn.

MACHINERY—Covering Wire
Fidelity Machine Co., Philadelphia, Pa.
Syncro Machine Co., Rahway, N. J.

MACHINERY—Cutting
Broden Construction Co., Cleveland, O.
Hallden Machine Co., Thomaston, Conn.
Lewis Machine Co., The, Cleveland, O.
Moslo Machinery Inc., Cleveland, O.
National Machinery Exchange (Used), New York, N. Y.
Shuster, F. B., Co., New Haven, Conn.
Sleeper & Hartley, Inc., Worcester, Mass.
Syncro Machine Co., Rahway, N. J.

MACHINERY—Die Making
Firth-Sterling Steel Co., McKeesport, Pa.

MACHINERY—Draw Benches
Standard Machinery Co., Providence, R. I.

MACHINERY—Edging
Standard Machinery Co., Providence, R. I.

MACHINERY—Enameling
American Insulating Mach'y. Co., Phila., Pa.
Syncro Machine Co., Rahway, N. J.

MACHINERY—Extruding
Robertson, John, Co., Brooklyn, N. Y.
Royle, John & Sons, Paterson, N. J.
Watson Machine Co., Paterson, N. J.

MACHINERY—Flat Wire
Broden Construction Co., Cleveland, O.
Ruesch, H. J., Machine Co., Newark, N. J.
Sleeper & Hartley, Inc., Worcester, Mass.
Torrington Mfg. Co., The, Torrington, Conn.

MACHINERY—Forming
National Machinery Exchange (Used), New York, N. Y.
Sleeper & Hartley, Inc., Worcester, Mass.
Standard Machinery Co., Providence, R. I.
Torrington Mfg. Co., The, Torrington, Conn.

MACHINERY—Galvanizing
Lee Wilson Engineering Co., Cleveland, Ohio

MACHINERY—Galvanizing Wire
Broden Construction Co., Cleveland, O.
Lee Wilson Engineering Co., Cleveland, Ohio
Sleeper & Hartley, Inc., Worcester, Mass.
Vaughn Machinery Co., Cuyahoga Falls, O.

MACHINERY—Gang Winders
Fidelity Machine Co., Philadelphia, Pa.
Ruesch, H. J., Machine Co., Newark, N. J.
Syncro Machine Co., Rahway, N. J.
Watson Machine Co., Paterson, N. J.

MACHINERY—Grinding
Norton Co., Worcester, Mass.

MACHINERY—Insulating
American Insulating Mach'y. Co., Phila., Pa.
Fidelity Machine Co., Philadelphia, Pa.
National Rubber Machinery Co., Akron, O.
New England Butt Co., Providence, R. I.
Royle, John & Sons, Paterson, N. J.
Syncro Machine Co., Rahway, N. J.
Watson Machine Co., Paterson, N. J.

MACHINERY—Knitting
Fidelity Machine Co., Philadelphia, Pa.

MACHINERY—Lead Encasing
Robertson, John, Co., Brooklyn, N. Y.

MACHINERY—Lead Stripping
Robertson, John, Co., Brooklyn, N. Y.
Watson Machine Co., Paterson, N. J.

MACHINERY—Lock Washer
Sleeper & Hartley, Inc., Worcester, Mass.
Torrington Mfg. Co., Torrington, Conn.

MACHINERY—Magnet Wire
American Insulating Mach'y. Co., Phila., Pa.
New England Butt Co., Providence, R. I.
Sleeper & Hartley, Inc., Worcester, Mass.
Syncro Machine Co., Rahway, N. J.
Torrington Mfg. Co., The, Torrington, Conn.

MACHINERY—Material Handling
American Monorail Co., Cleveland, O.
Cleveland Tramrail Div. of the Cleveland Crane & Engineering Co., Wickliffe, Ohio.

MACHINERY — Measuring Wire & Cable
Durant Mfg. Co., Milwaukee, Wis.
New England Butt Co., Providence, R. I.
Watson Machine Co., Paterson, N. J.

MACHINERY—Nail and Tack
Glader, Wm., Machine Works Co., Chicago, Ill.
National Machinery Exchange (Used), New York, N. Y.
Sleeper & Hartley, Inc., Worcester, Mass.

MACHINERY—Panning
American Insulating Mach'y. Co., Phila., Pa.
Syncro Machine Co., Rahway, N. J.

MACHINERY—Pointing
Broden Construction Co., Cleveland, O.
Ruesch, H. J., Machine Co., Newark, N. J.
Scudder, E. J., Fdry. & Machine Co., Trenton, N. J.
Sleeper & Hartley, Inc., Worcester, Mass.
Standard Machinery Co., Providence, R. I.
Syncro Machine Co., Rahway, N. J.
Torrington Mfg. Co., The, Torrington, Conn.
Vaughn Machinery Co., Cuyahoga Falls, O.
Waterbury-Farrel Fdry. & Machine Co., Waterbury, Conn.

MACHINERY—Rod Mill
Broden Construction Co., Cleveland, O.
Morgan Construction Co., Worcester, Mass.
Ruesch, H. J., Machine Co., Newark, N. J.

MACHINERY—Rolling Mill
Broden Construction Co., Cleveland, O.
Morgan Construction Co., Worcester, Mass.
National Machinery Exchange (Used), New York, N. Y.
Ruesch, H. J., Machine Co., Newark, N. J.
Standard Machinery Co., Providence, R. I.
Syncro Machine Co., Rahway, N. J.
Torrington Mfg. Co., The, Torrington, Conn.
Waterbury-Farrel Fdry. & Machine Co., Waterbury, Conn.

MACHINERY—Rubber for Insulating Wire
National Rubber Machinery Co., Akron, O.
Royle, John & Sons, Paterson, N. J.

MACHINERY—Rubber Strip Covering
National Rubber Machinery Co., Akron, O.
New England Butt Co., Providence, R. I.
Watson Machine Co., Paterson, N. J.

MACHINERY—Rubber Tubing and Straining
National Rubber Machinery Co., Akron, O.
New England Butt Co., Providence, R. I.
Royle, John, & Sons, Paterson, N. J.
Sleeper & Hartley, Inc., Worcester, Mass.
Torrington Mfg. Co., The, Torrington, Conn.
Watson Machine Co., Paterson, N. J.

MACHINERY—Screw Wire
National Machinery Exchange (Used), New York, N. Y.
Sleeper & Hartley, Worcester, Mass.

MACHINERY—Special
American Insulating Mach'y. Co., Phila., Pa
Broden Construction Co., Cleveland, O.
National Rubber Machinery Co., Akron, O.
New England Butt Co., Providence, R. I.
Ruesch, H. J., Machine Co., Newark, N. J.
Scudder, E. J., Fdry. & Machine Co., Trenton, N. J.
Sleeper & Hartley, Inc., Worcester, Mass.
Standard Machinery Co., Providence, R. I. (Special Designs)
Syncro Machine Co., Rahway, N. J.
Torrington Mfg. Co., The, Torrington, Conn.
Watson Machine Co., Paterson, N. J.

MACHINERY—Spooling
American Insulating Mach'y. Co., Phila., Pa.
Fidelity Machine Co., Philadelphia, Pa.
New England Butt Co., Providence, R. I.
Sleeper & Hartley, Inc., Worcester, Mass.
Syncro Machine Co., Rahway, N. J.
Torrington Mfg. Co., The, Torrington, Conn.
Vaughn Machinery Co., Cuyahoga Falls, O.
Waterbury-Farrel Fdry. & Machine Co., Waterbury, Conn.
Watson Machine Co., Paterson, N. J.

MACHINERY—Spring Making
National Machinery Exchange (Used), New York, N. Y.
Sleeper & Hartley, Inc., Worcester, Mass.
Torrington Mfg. Co., The, Torrington, Conn.

MACHINERY—Staple
Sleeper & Hartley, Inc., Worcester, Mass.

MACHINERY—Straightening
Broden Construction Co., Cleveland, O.
Hallden Machine Co., Thomaston, Conn.
Lewis Machine Co., The, Cleveland, O.
Moslo Machinery, Inc., Cleveland, O.
National Machinery Exchange (Used), New York, N. Y.
Ruesch, H. J., Machine Co., Newark, N. J.
Shuster, F. B., Co., New Haven, Conn.
Sleeper & Hartley, Inc., Worcester, Mass.
Torrington Mfg. Co., The, Torrington, Conn.

MACHINERY—Stranding
National Rubber Machinery Co., Akron, O.
New England Butt Co., Providence, R. I.
Sleeper & Hartley, Inc., Worcester, Mass.
Thomson-Judd Wire Machinery Co., Sub. of Thomson-Gibb Electric Welding Co., Lynn, Mass.
Torrington Mfg. Co., The, Torrington, Conn.
Watson Machine Co., Paterson, N. J.

MACHINERY—Strip Steel
Broden Construction Co., Cleveland, O.
Ruesch, H. J., Machine Co., Newark, N. J.
Torrington Mfg. Co., The, Torrington, Conn.

MACHINERY—Swaging
National Machinery Exchange (Used), New York, N. Y.
Ruesch, H. J., Machine Co., Newark, N. J.
Sleeper & Hartley, Inc., Worcester, Mass.
Standard Machinery Co., Providence, R. I.
Syncro Machine Co., Rahway, N. J.
Waterbury-Farrel Fdry. & Machine Co., Waterbury, Conn.

MACHINERY—Taping
American Insulating Mach'y. Co., Phila., Pa.
Fidelity Machine Co., Philadelphia, Pa.
New England Butt Co., Providence, R. I.
Syncro Machine Co., Rahway, N. J.
Thomson-Judd Wire Machinery Co., Sub. of Thomson-Gibb Electric Welding Co., Lynn, Mass.
Torrington Mfg. Co., The, Torrington, Conn.
Watson Machine Co., Paterson, N. J.

MACHINERY—Testing
Entwistle, James L., Pawtucket, R. I.
Scott, Henry L., Co., Providence, R. I.

MACHINERY—Testing Size of Wire
Torrington Mfg. Co., The, Torrington, Conn.

MACHINERY—Testing—Spring
Standard Machinery Co., Providence, R. I.

MACHINERY—Tinsel Rolling Mills
American Insulating Mach'y. Co., Phila., Pa.
Syncro Machine Co., Rahway, N. J.

MACHINERY—Trolley Wire
Vaughn Machinery Co., Cuyahoga Falls, O.

MACHINERY—Tube Mill
Ruesch, H. J., Machine Co., Newark, N. J.
Torrington Mfg. Co., The, Torrington, Conn.

MACHINERY—Welding Wire
Eisler Engineering Co., Inc., Newark, N. J.
Micro Products Co., Chicago, Ill.
Shuster, F. B., Co., New Haven, Conn.
Thomson-Judd Wire Machinery Co., Sub. of Thomson-Gibb Electric Welding Co., Lynn, Mass.

MACHINERY—Winding
American Insulating Mach'y. Co., Phila., Pa.
Entwistle, James L., Pawtucket, R. I.
Fidelity Machine Co., Philadelphia, Pa.
New England Butt Co., Providence, R. I.
Sleeper & Hartley, Inc., Worcester, Mass.
Syncro Machine Co., Rahway, N. J.
Torrington Mfg. Co., The, Torrington, Conn.
Watson Machine Co., Paterson, N. J.

MACHINERY—Wire Drawing
American Insulating Mach'y. Co., Phila., Pa.
Broden Construction Co., Cleveland, O.
Morgan Construction Co., Worcester, Mass.
National Machinery Exchange (Used), New York, N. Y.
Reactive Wire Drawing, Worcester, Mass.
Ruesch, H. J., Machine Co., Newark, N. J.
Scudder, E. J., Fdry. & Machine Co., Trenton, N. J.
Sleeper & Hartley, Inc., Worcester, Mass.
Standard Machinery Co., Providence, R. I.
Syncro Machine Co., Rahway, N. J.
Thomson-Judd Wire Machinery Co., Sub. of Thomson-Gibb Electric Welding Co., Lynn, Mass.
Torrington Mfg. Co., The, Torrington, Conn.
Vaughn Machinery Co., Cuyahoga Falls, O.
Waterbury-Farrel Fdry. & Machine Co., Waterbury, Conn.

MACHINERY—Wire Measuring
Durant Mfg. Co., Milwaukee, Wis.
Watson Machine Co., Paterson, N. J.

MACHINERY—Wire Rope
National Rubber Machinery Co., Akron, O.
New England Butt Co., Providence, R. I.
Thomson-Judd Wire Machinery Co., Sub. of Thomson-Gibb Electric Welding Co., Lynn, Mass.
Watson Machine Co., Paterson, N. J.

MACHINERY—Wire Tinning
American Insulating Mach'y. Co., Phila., Pa.
New England Butt, Co., Providence, R. I.
Syncro Machine Co., Rahway, N. J.

MACHINERY—Wood Screw
National Machinery Exchange (Used), New York, N. Y.

WHERE TO BUY, Continued

MATERIAL HANDLING EQUIPMENT—
American Monorail Co., Cleveland, O.
Cleveland Tramrail Div. of the Cleveland Crane & Engineering Co., Wickliffe, Ohio.

MILLS—Tandem Rolling and Edging
Standard Machinery Co., Providence, R. I.
Torrington Mfg. Co., The, Torrington, Conn.

NICKEL SILVER AND PHOSPHOR BRONZE—Rod, Wire and Strip
Hudson Wire Co., Ossining, N. Y.
Seymour Mfg. Co., Seymour, Conn.

OILS—Wire Drawing
National Oil Products Co., Harrison, N. J.
Standard Industrial Compounds Co., Chicago, Ill.

OVENS—Industrial
Carl-Mayer Corp., Cleveland, Ohio.
Morrison Engineering Corp., Cleveland, O.
Ross Engineering Corp., J. O., New York, N. Y.

PANS—Vulcanizing
Mossberg Pressed Steel Corp., Attleboro, Mass.

PAPER TESTERS—
Scott, Henry L., Co., Providence, R. I.

PATENT ATTORNEYS—
Lancaster, Allwine and Rommel, Washington, D. C.

PICKLING COMPOUNDS
American Chemical Paint Co., Ambler, Pa.
National Oil Products Co., Harrison, N. J.

PLASTIC TESTERS—
Scott, Henry L., Co., Providence, R. I.

POTS—Lead Melting
Robertson, John, Co., Brooklyn, N. Y.

PRESSES—Hydraulic and Mechanical
Robertson, John, Co., Brooklyn, N. Y.
Standard Machinery Co., Providence, R. I. (Mechanical Only)

PRESSES—Lead
Robertson, John, Co., Brooklyn, N. Y.

PULLERS—Wire
Scudder, E. J., Fdry. & Machine Co., Trenton, N. J.
Sleeper & Hartley, Inc., Worcester, Mass.

PUMPS—Hydraulic
Robertson, John, Co., Brooklyn, N. Y.

REACTIVE WIRE DRAWING
Reactive Wire Drawing, Worcester, Mass.

RECORDERS—Fault and Reel
Entwistle, James L., Pawtucket, R. I.

REEL AND TENSION STAND—
Fidelity Machine Co., Philadelphia, Pa.
Moslo Machinery, Inc., Cleveland, O.
Sleeper & Hartley, Inc., Worcester, Mass.
Syncro Machine Co., Rahway, N. J.
Torrington Mfg. Co., The, Torrington, Conn.

REEL CRUTCHES—
Watson Machine Co., Paterson, N. J.

REELS—Annealing and Stranding
Apco Mossberg Co., Attleboro, Mass.
Moslo Machinery, Inc., Cleveland, O.
Mossberg Pressed Steel Corp., Attleboro, Mass.
Shuster Co., F. B., New Haven, Conn.
Stevens Metal Products Co., Niles, O.

REELS—Steel
Apco Mossberg Co., Attleboro, Mass.
Hayward Co., R. B., Chicago, Ill.
Mossberg Pressed Steel Corp., Attleboro, Mass.
Stevens Metal Products Co., Niles, O.

REELS AND SPOOLS—Shipping and Shop
Apco Mossberg Co., Attleboro, Mass.
Hayward Co., R. B., Chicago, Ill.
Mossberg Pressed Steel Corp., Attleboro, Mass.
Stevens Metal Products Co., Niles, O.

REELS—Takeoff
Apco Mossberg Co., Attleboro, Mass.
Hayward Co., R. B., Chicago, Ill.
Moslo Machinery Inc., Cleveland, O.
Mossberg Pressed Steel Corp., Attleboro, Mass.
Shuster, F. B. Co., New Haven, Conn.
Stevens Metal Products Co., Niles, O.

REELS—Vulcanizing and Impregnating
Apco Mossberg Co., Attleboro, Mass.
Hayward Co., R. B., Chicago, Ill.
Mossberg Pressed Steel Corp., Attleboro, Mass.
Shuster, F. B. Co., New Haven, Conn.
Stevens Metal Products, Co., Niles, O.

REELS—Wire Drawing
Apco Mossberg Co., Attleboro, Mass.
Hayward Co., R. B., Chicago, Ill.
Moslo Machinery, Inc., Cleveland, O.
Mossberg Pressed Steel Corp., Attleboro, Mass.
Stevens Metal Products, Co., Niles, O.

REFRACTORIES—High Temperature
Norton Co., Worcester, Mass.

ROD BAKERS
Carl-Mayer Corp., The, Cleveland, O.
Morrison Engineering Corp., Cleveland, O.
Moslo Machinery, Inc., Cleveland, O.
Ross Engineering Corp., J. O., New York, N. Y.

RODS—Wire—Non-Ferrous
Hudson Wire Co., Ossining, N. Y.
Platt Bros. & Co., The, Waterbury, Conn.
Seymour Mfg. Co., Seymour, Conn.

RODS—Wire—Steel
Bethlehem Steel Co., Bethlehem, Pa.
Continental Steel Corp., Kokomo, Ind.
Jones & Laughlin Steel Corp., Pittsburgh, Pa.
Keystone Steel & Wire Co., Peoria, Ill.
Pittsburgh Steel Co., Pittsburgh, Pa.

ROLL STRAIGHTENERS—
Moslo Machinery, Inc., Cleveland, O.

RUBBER AND RUBBER COMPRESSION TESTERS—
Scott, Henry L., Co., Providence, R. I.

RUST PROOF COMPOUND—
American Lanolin Co., Lawrence, Mass.

SHEET—Steel
Continental Steel Corp., Kokomo, Ind.
Jones & Laughlin Steel Corp., Pittsburgh, Pa.

SKIN PROTECTOR—
Magnus Chemical Co., Garwood, N. J.

SOAPS—Industrial and Wire Drawing
Magnus Chemical Co., Garwood, N. J.
Miller, Co., R. H., Homer, N. Y.
National Oil Products Co., Harrison, N. J.
Standard Industrial Compounds Co., Chicago, Ill.

SPARK TESTING EQUIPMENT—
Entwistle, James L., Pawtucket, R. I.

SPOOLS—Annealing and Wire Drawing
Apco Mossberg Co., Attleboro, Mass.
Mossberg Pressed Steel Corp., Attleboro, Mass.
Stevens Metal Products Co., Chicago, Ill.

SPOOLS—Shipping and Shop
Apco Mossberg Co., Attleboro, Mass.
Hayward Co., R. B., Chicago, Ill.
Mossberg Pressed Steel Corp., Attleboro, Mass.
Stevens Metal Products Co., Niles, O.

SPOOLS—Steel
Apco Mossberg Co., Attleboro, Mass.
Hayward Co., R. B., Chicago, Ill.
Mossberg Pressed Steel Corp., Attleboro, Mass.
Stevens Metal Products Co., Niles, O.

STAMPINGS—Steel
Mossberg Pressed Steel Corp., Attleboro, Mass.

STRIP—Brass and Non Ferrous
Hudson Wire Co., Ossining, N. Y.
Seymour Mfg. Co., Seymour, Conn.

STRIP—Steel
Bethlehem Steel Corp., Bethlehem, Pa.
Continental Steel Corp., Kokomo, Ind.
Firth-Sterling Steel Co., McKeesport, Pa.
Jones & Laughlin Steel Corp., Pittsburgh, Pa.
Pittsburgh Steel Co., Pittsburgh, Pa.

STRIP METAL TESTERS—
Scott, Henry L., Co., Providence, R. I.

SWIFTS—Take-off
Apco Mossberg Co., Attleboro, Mass.
Mossberg Pressed Steel Corp., Attleboro, Mass.

TAKE-UPS FOR CABLE, HOSE, LEAD PRESSES AND SHEET RUBBER—
Entwistle, James L., Pawtucket, R. I.

TANKS—Acid
Hauser-Stander Tank Co., Cincinnati, O.

TANKS—Compound
Watson Machine Co., Paterson, N. J.

TANKS—Lead Lined
Hauser-Stander Tank Co., Cincinnati, O.

TANKS—Pickling
Hauser-Stander Tank Co., Cincinnati, O.

TANKS—Rubber Lined
Hauser-Stander Tank Co., Cincinnati, O.

TANKS—Steel
Mossberg Pressed Steel Corp., Attleboro, Mass.

TANKS—Wooden
Hauser-Stander Tank Co., Cincinnati, O.

TENSILE TESTERS—
Scott, Henry L., Co., Providence, R. I.

TESTING INSTRUMENTS—
Entwistle, James L., Pawtucket, R. I.
Scott Co., Henry L., Providence, R. I.

TRAMRAIL SYSTEMS—
Cleveland Tramrail Div. of the Cleveland Crane & Engineering Co., Wickliffe, Ohio.

TREADS—Safety
Norton Co., Worcester, Mass.

TRUCKS—
Morgan Construction Co., Worcester, Mass.
Vaughn Machinery Co., Cuyahoga Falls, O.

TUBE BENDERS AND FORMERS—
Ruesch, H. J., Machine Co., Newark, N. J.

TURKS HEADS—Friction and Power Driven
Standard Machinery Co., Providence, R. I.

VULCANIZERS—
Watson Machine Co., Paterson, N. J.

VULCANIZING PANS—
American Insulating Mach'y. Co., Phila., Pa.

WELDERS—Spot and Butt
Eisler Engineering Co., Newark, N. J.
Micro Products Co., Chicago, Ill.
Moslo Machinery, Inc., Cleveland, O.

WIRE—Cold Heading
Bethlehem Steel Co., Bethlehem, Pa.
Continental Steel Corp., Kokomo, Ind.
Jones & Laughlin Steel Corp., Pittsburgh, Pa.
Keystone Steel & Wire Co., Peoria, Ill.
Pittsburgh Steel Co., Pittsburgh, Pa.

WIRE DRAWING—High Grade Custom
Hy-Carbo Steel Co., Lowell, Mass.

WIRE—Electric
Hudson Wire Co., Ossining, N. Y.
Seymour Mfg. Co., Seymour, Conn.

WIRE—Enameled For Coils
Winsted Div. of Hudson Wire Co., Winsted, Conn.

WIRE—Manufacturers
Bethlehem Steel Co., Bethlehem, Pa.
Continental Steel Corp., Kokomo, Ind.
Firth-Sterling Steel Co., McKeesport, Pa.
Jones & Laughlin Steel Corp., Pittsburgh, Pa.
Keystone Steel & Wire Co., Peoria, Ill.
Pittsburgh Steel Co., Pittsburgh, Pa.

WIRE—Nickel Silver and Phosphor Bronze
Hudson Wire Co., Ossining, N. Y.
Seymour Mfg. Co., Seymour, Conn.

WIRE—Non Ferrous to Specification For Special Purposes
Hudson Wire Co., Ossining, N. Y.
Seymour Mfg. Co., Seymour, Conn.
Winsted Div. of Hudson Wire Co., Winsted, Conn.

WIRE—Spring
Bethlehem Steel Co., Bethlehem, Pa.
Continental Steel Corp., Kokomo, Ind.
Firth-Sterling Steel Co., McKeesport, Pa.
Jones & Laughlin Steel Corp., Pittsburgh, Pa.
Keystone Steel & Wire Co., Peoria, Ill.
Pittsburgh Steel Co., Pittsburgh, Pa.

WIRE—Stainless Steel
Firth-Sterling Steel Co., McKeesport, Pa.

WIRE—Steel—Also Coppered Steel——Also Galvanized Steel
Bethlehem Steel Co., Bethlehem, Pa.
Continental Steel Corp., Kokomo, Ind.
Jones & Laughlin Steel Corp., Pittsburgh, Pa.
Keystone Steel & Wire Co., Peoria, Ill.
Pittsburgh Steel Co., Pittsburgh, Pa.

WIRE AND STRIP—Zinc
Platt Bros. & Co., The, Waterbury, Conn.

WIRE TESTERS—
Scott, Henry L., Co., Providence, R. I.

WIRE, WEAVING—Non Ferrous
Hudson Wire Co., Ossining, N. Y.

YARN TESTERS—
Scott, Henry L., Co., Providence, R. I.

You Can Tell Your Sales Story To

Hundreds of Prospects:-

THE KIND OF PROSPECTS YOUR SALESMEN DREAM ABOUT—RESPONSIBLE, TRAINED, KEY MEN IN THEIR PLANTS—WITH OVER 90% OF THE AMERICAN AND CANADIAN ROD, WIRE AND WIRE PRODUCTS PRODUCTION DEFINITELY UNDER THEIR CONTROL AND SUPERVISION.

▲▲▲

Reach this Market—

THE WIRE AND WIRE PRODUCTS INDUSTRY THROUGH ADVERTISING IN

WIRE AND WIRE PRODUCTS

▲▲▲

YOUR USE OF ADVERTISING SPACE IN THIS PUBLICATION WILL RESULT IN SALES OF YOUR PRODUCT, EQUIPMENT, SUPPLIES OR SERVICES.

▲▲▲

We offer a complete industrial coverage through
Technical Information—in "Wire and Wire Products"
Buying Reference in the "Annual Wire Buyers Guide"
Special Mailing Lists for Advertisers
Personal Contacts Through Membership in The Wire Association
Exhibit Space at the National Metal Congress Exposition
An Information Service for Advertisers

YOU WILL BENEFIT FROM OUR SERVICE
FOR COMPLETE DETAILS
WRITE

WIRE AND WIRE PRODUCTS

300 MAIN ST.,
STAMFORD, CONN.

This Furnace

is Bright Annealing

High Carbon Alloy Seamless Steel Tubing for Golf Shafts . . . 2000 lbs. per hour

High Carbon Seamless Steel Tubing for Golf Shafts—at the rate of 2000 lbs. per hour—is bright annealed, uniformly, and continuously in the continuous controlled atmosphere combination gas-electric furnace installation shown above. This furnace — which is entirely automatic in operation and control — will handle tubing in any desired diameter or length at any specified temperature from 1250 degrees F. to 1750 degrees F.

Golf shafts are made of fairly high carbon alloy seamless steel tubing which must be annealed repeatedly during preliminary operations. The annealing process is very exacting — non-decarb is very essential as any decarburization of the thin sections at this point would be cumulative and might spoil a large number of shafts. A uniform and bright anneal is also necessary. The above E. F. Furnace produces the desired results.

Submit your furnace problems to E. F. engineers. With over 20 years furnace building experience—with hundreds of successful installations operating on practically every heating and heat treating process, and with both electric and fuel divisions, we are in position to analyze any furnace or heat treating problem, give an unbiased report and recommend the best size and type for the specific problem.

Send for printed matter showing other installations for bright annealing wire, strip, tubing and stampings; for copper brazing, scale-free heat treating, nitriding, carburizing, enameling, heating for forging or any other process in which you are interested.

The ELECTRIC FURNACE Co.

ELECTRIC & FUEL FIRED Furnaces

SALEM, OHIO